VOLUME 11 NUMBER 4

October • 1956

JOURNAL OF GERONTOLOGY

Contents

Section A—Biological Sciences and Clinical Medicine

PAGE

LIFE SPAN AND CAUSES OF DEATH IN INBRED MICE IN RELATION TO DIET ..... *Y. Chiung Puh Lee, Maurice B. Visscher, and Joseph T. King* 364

AGE CHANGES IN THE SWELLING CAPACITY OF HUMAN ACHILLES TENDON ..... *William G. Banfield* 372

THE ALDOLASE ACTIVITY OF AORTIC AND PULMONARY ARTERY TISSUE IN INDIVIDUALS OF VARIOUS AGES ..... *J. E. Kirk and L. B. Sørensen* 373

PULMONARY FUNCTION STUDIES: AGE DIFFERENCES IN LUNG VOLUMES AND BELLOWS FUNCTION *Arthur H. Norris, Nathan W. Shock, Milton Landowne, and Joseph A. Falzone, Jr.* 379

AGE AND THE RATIO T_mPAH/T_m DIODRAST IN MAN WITH A NOTE ON THE SELF-DEPRESSION OF T_m DIODRAST ..... *Irwin Stoloff, Donald M. Watkin, and Nathan W. Shock* 388

AGING AND THE LATENCY AND DURATION OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT AND SOUND STIMULI ..... *Lillian S. Kumnick* 391

GERIATRIC PRACTICE: THE CONTROL OF ARTERIAL HYPERTENSION IN OLDER INDIVIDUALS ..... *Henry A. Schroeder* 397

BOOK REVIEWS 402

Section B—Psychological and Social Sciences, and Social Work and Administration

RELATIONSHIPS AMONG WECHSLER, WEIGL, RORSCHACH, EEG FINDINGS, AND ABSTRACT-CONCRETE BEHAVIOR IN A GROUP OF NORMAL AGED SUBJECTS ..... *Margaret Thaler* 404

AN ATTEMPT TO USE PRODUCTION DATA IN THE STUDY OF AGE AND PERFORMANCE ..... *H. F. King* 410

A STUDY OF PERFORMANCE IN RELATION TO AGE AT TWO PRINTING WORKS ..... *Hilary M. Clay* 417

BOOK REVIEWS 425

Section C—Organization Section and Index to Current Periodical Literature Author Index to Current Periodical Literature, Index to Volume 11

ORGANIZATION SECTION: PROGRAM OF THE NINTH ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. 428

ABSTRACTS OF SCIENTIFIC PAPERS TO BE PRESENTED 435

FELLOWS AND MEMBERS OF THE GERONTOLOGICAL SOCIETY, INC. 451

INDEX TO CURRENT PERIODICAL LITERATURE 459

AUTHOR INDEX TO CURRENT PERIODICAL LITERATURE 487

INDEX TO VOLUME 11 500

General Information

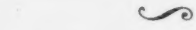
THE JOURNAL OF GERONTOLOGY is a quarterly journal owned and published by the Gerontological Society, Inc., New York, with editorial offices at 660 South Kingshighway Blvd., St. Louis 10, Missouri. It publishes original manuscripts dealing with or bearing on the problems of aging from the fields of natural and social sciences and the humanities, review articles, and selected abstracts from current literature appropriate to the subject. Preference will be given to manuscripts containing observational data.

The Gerontological Society, Inc., and the Editors accept no responsibility for the views and statements of the authors as published in their original communications.

INSTRUCTIONS TO CONTRIBUTORS

Lack of adherence to instructions may result in delay of publication.

1. Manuscripts should be addressed to the editorial offices, 660 South Kingshighway Blvd., St. Louis 10, Missouri.
2. Papers should rarely exceed twenty typewritten pages in length, including illustrations. They must be typewritten, double spaced, on standard-size white paper 8½"x11".
3. A condensed title for running page headline, not to exceed forty letters and spaces, should be supplied.
4. Tables are costly to print and should be used only when necessary to clarity. In such cases they should be as condensed as possible and typed on a separate sheet. Tabular matter in excess of 20 per cent of the cost of composition and printing of the manuscript is to be at the expense of the author.
5. Typed legends including the author's name should be clipped to each illustration. Each plate must be arranged by the author. Engraving charges in excess of 20 per cent of the cost of composition and printing of the manuscript are to be at the expense of the author. If illustrations are larger than manuscript sheet size, small prints, as well as the original drawings, should be submitted with the manuscript to facilitate mailing to reviewers. The reduction of figures desired should be clearly indicated on the margin of the drawing. Drawings should be in India ink on white paper, and if background lines are used they should be blue. All lettering should be large enough to give 2 mm. letters in the final Journal reduction. Maximum plate size is 5¼" x 8" (if legends are to be included on the same page the length should be correspondingly less). Final single column plate width is 2¾".
6. Authors are requested to limit the use of footnotes.
7. Every paper should end with a brief summary in which the points established by the investigation are outlined.
8. References to periodical literature must be arranged alphabetically and given in order; name of author, title of article, name of periodical (abbreviated as in Fishbein, *Medical Writing*), volume number, inclusive pagination, and year. For books: name of author, title of book, publisher, city, and year. Example, for periodical literature: Gofman, J. W., Lindgren, F. T., Jones, H. B., Lyon, T. P., and Strisower, B.: Lipoproteins and Atherosclerosis, *J. Gerontol., 6:* 105-119, 1951. For books: Monroe, R. T.: *Diseases in Old Age.* Harvard University Press, Cambridge, 1951.
9. Articles may be submitted to the Journal in a foreign language but if accepted must be translated at the responsibility and expense of the author.
10. Submission of a paper to this Journal is held to imply that it has not been published and is not to be published elsewhere (except as Society Proceedings) without permission from the JOURNAL OF GERONTOLOGY.



Subscription prices a year beginning with volume 8, 1953: In the United States and Canada the JOURNAL OF GERONTOLOGY is $10.00; in other countries the Journal is $10.50 (the equivalent of $10.50 U. S. currency on the day of transfer). Single copies of the Journal are available at $2.50. Back issues, 1946-1949, are $6.00 a volume; 1950-1952 issues are $8.00 a volume, plus 50c postage to foreign countries. Checks should be made payable to the JOURNAL OF GERONTOLOGY. New subscriptions and renewals are entered to begin with the first issue of the current volume. Four weeks' notice is required for change of address.

Publication office at 1712-24 Chouteau Avenue, St. Louis, Missouri. Editorial Office at 660 South Kingshighway Blvd., St. Louis 10, Missouri. All communications and remittances relating to subscriptions, back volumes, advertising, and remittances for reprints, etc., should be directed to the office of the editor, 660 South Kingshighway Blvd., St. Louis 10, Missouri.

Entered as second class matter at the post office of St. Louis, Missouri.

Copyright © 1956 by the Gerontological Society, Inc. All rights in the JOURNAL OF GERONTOLOGY are reserved. No part may be reproduced in any form whatsoever without permission in writing from the Journal, except by a reviewer who wishes to quote brief passages in connection with a critical review. Reproduction in whole or in part in digests, in condensations of the literature, in lectures, or in films, or by any other processes or devices is reserved by the Journal.

JOURNAL OF GERONTOLOGY

VOLUME CONTENTS

VOL. 11 NO. 1-4

1956

Published Quarterly by the
GERONTOLOGICAL SOCIETY, INC.

JOURNAL OF GERONTOLOGY

Contents of Volume 11

VOLUME 11 JANUARY, 1956 NUMBER 1

Section A—Biological Sciences and Clinical Medicine

PAGE

THE POSSIBLE ROLE OF THE GEL-FIBER RATIO OF CONNECTIVE TISSUE IN THE AGING PROCESS ... *Harry Sobel and Jessie Marmorston* 2
YOUNG RATS WITH ADULT ADRENAL TRANSPLANTS: A PHYSIOLOGICAL STUDY ... *Erich Geiringer* 8
AN AGE DIFFERENCE IN PROPORTIONS OF CELL TYPES IN THE EPIDERMIS OF ABDOMINAL SKIN OF THE RAT ... *Warren Andrew and Nancy V. Andrew* 18
VARIATION WITH AGE IN THE FUMARASE ACTIVITY OF HUMAN AORTIC AND PULMONARY ARTERY TISSUE ... *L. B. Sørensen and J. E. Kirk* 28
THE BETA-GLUCURONIDASE ACTIVITY OF AORTIC AND PULMONARY ARTERY TISSUE IN INDIVIDUALS OF VARIOUS AGES ... *M. Dyrbye and J. E. Kirk* 33
AGING AND PUPILLARY RESPONSE TO LIGHT AND SOUND STIMULI ... *Lillian S. Kumnick* 38
AGING AND DECAY OF PUPILLARY PSYCHOSENSORY RESTITUTION ... *Lillian S. Kumnick* 46
CHANGES OF THYROID ACTIVITY IN THE RAT IN OLD AGE ... *F. Verzár and V. Freydberg* 53
THE INFLUENCE OF PITUITARY FACTORS ON MENOPAUSAL VASOMOTOR INSTABILITY ... *Arthur A. Hellbaum, J. B. Eskridge, III, and Richard W. Payne* 58
URINARY EXCRETION AFTER THE AGE OF NINETY. A STUDY OF NEUTRAL 17-KETOSTEROIDS, CREATININE, AND CREATINE ... *Trevor H. Howell* 61
FOOD PRACTICES OF OLDER PEOPLE LIVING AT HOME ... *Julia S. Lyons and Martha F. Trulson* 66

Section B—Psychological and Social Sciences, and Social Work and Administration

SOME EXPERIMENTAL TESTS OF THE EFFECT OF AGE ON CREATIVE INTELLECTUAL OUTPUT ... *Dennis B. Bromley* 74
OCCURRENCE OF RESISTANT *Staphylococci* IN AN INSTITUTION FOR THE AGED IN COPENHAGEN ... *Erna Lund and Ole Sylvest* 83
BOOK REVIEWS ... 90

Section C—Index to Current Periodical Literature

INDEX TO CURRENT PERIODICAL LITERATURE ... 94

VOLUME 11 APRIL, 1956 NUMBER 2

Section A—Biological Sciences and Clinical Medicine

SERUM ELPHEROGRAMS IN RABBITS ON LIPID DIETS. I. COTTONSEED OIL, CHOLESTEROL, OR CHOLESTEROL IN OIL ... *O. J. Pollak* 120
SERUM ELPHEROGRAMS IN RABBITS ON LIPID DIETS. II. COTTONSEED OIL, CHOLESTEROL, OR CHOLESTEROL IN OIL, COMBINED WITH PANCREATIN FEEDINGS IN INTACT AND IN PARTIALLY DEPANCREATIZED RABBITS ... *O. J. Pollak* 125
THE PHENOLSULFATASE ACTIVITY OF AORTIC AND PULMONARY ARTERY TISSUE IN INDIVIDUALS OF VARIOUS AGES ... *J. E. Kirk and M. Dyrbye* 129
MUSCULAR DYSTROPHY IN AGING RATS ... *Benjamin N. Berg* 134
METABOLIC RATE OF OLD RATS WITH SPONTANEOUS BREAST TUMORS ... *Max Kleiber and Theodore Chernikoff* 140

PAGE

AGEWISE VARIATION OF VITAMIN B_{12} SERUM LEVELS ... *Bacon F. Chow, Ruth Wood, Andy Horonick, and Kunio Okuda* 142
THE RIBOFLAVIN CONCENTRATION OF BRAIN, HEART, AND SKELETAL MUSCLE IN INDIVIDUALS OF VARIOUS AGES ... *R. Schaus and J. E. Kirk* 147
MEASUREMENT OF PROTEIN DIGESTION AND ABSORPTION IN AGED PERSONS BY A TEST MEAL OF I^{131} LABELED PROTEIN ... *Austin B. Chinn, Paul S. Lavik, and Donald B. Cameron* 151
RELATION OF DIETARY INTAKE TO BONE FRAGILITY IN THE AGED ... *Olive B. Hayes, Lucille J. Bowser, and Martha F. Trulson* 154
AGING AND THE EFFICIENCY OF THE PUPILLARY MECHANISM ... *Lillian S. Kumnick* 160
THE EFFECTS OF ALPHA-(2-PIPERIDYL) BENZHYDROL HYDROCHLORIDE (MERATRAN) ON PSYCHOMOTOR PERFORMANCE IN A GROUP OF AGED MALES ... *Robert W. Kleemeier, Thomas A. Rich, and Will A. Justiss* 165
NINETY-NINE YEAR OLD MONOZYGOTIC TWINS ... *Gösta Sandelius* 171
BOOK REVIEWS ... 175

Section B—Psychological and Social Sciences, and Social Work and Administration

AN INVESTIGATION OF THE LIVING CONDITIONS AND HEALTH OF 1389 PERSONS AGED 70 YEARS OR MORE IN NORWAY ... *Axel Ström* 178
THE ATTITUDE AND ADJUSTMENT OF INSTITUTIONALIZED AND NON-INSTITUTIONALIZED CATHOLIC AGED ... *J. Richard Lepkowski* 185
CONDITIONS OF AGED HOSPITAL PATIENTS ... *Martha Fraenkel* 192
PSYCHOLOGIC RESEARCH NEEDS IN GERONTOLOGY ... *Wilma Donahue* 196
RETIREMENT AND LIFE EXPECTANCY ... *Clark L. Hosmer* 204
REJOINDER ... *C. A. McMahan and T. R. Ford* 205
BOOK REVIEWS ... 206

Section C—Organization Section, Reports from Foreign Correspondents, and Index to Current Periodical Literature

ORGANIZATION SECTION ... 208
REPORTS FROM FOREIGN CORRESPONDENTS ... 213
INDEX TO CURRENT PERIODICAL LITERATURE ... 217

VOLUME 11 JULY, 1956 NUMBER 3

Section A—Biological Sciences and Clinical Medicine

METACOLLAGEN AS THE APPARENT ELASTIN ... *Ilona Banga, Joseph Baló, and Desiderius Szabó* 242
BASEMENT MEMBRANES, GROUND SUBSTANCE, AND LYMPHOCYTIC AGGREGATES IN AGING ORGANS ... *Sheldon C. Sommers* 251
TREATMENT OF SENESCENT MALE RATS WITH CORTISONE ACETATE ALONE OR TOGETHER WITH SEX AND THYROID HORMONES ... *V. Korenchevsky* 261
PERITONEAL FLUID MAST CELLS: THEIR NUMBERS AND MORPHOLOGY IN RATS OF VARIOUS BODY WEIGHTS (AGES) ... *Jacques Padawer and Albert S. Gordon* 268
HEXOSAMINE AND ACID-HYDROLYZABLE SULFATE CONCENTRATIONS OF THE AORTA AND PULMONARY ARTERY IN INDIVIDUALS OF VARIOUS AGES ... *J. E. Kirk and M. Dyrbye* 273
SOME BIOCHEMICAL ASPECTS OF AGING IN INSECTS ... *Morris Rockstein* 282
NEUROHYPOPHYSEAL RESPONSIVENESS IN THE NORMAL AND SENESCENT RAT ... *Sydney M. Friedman, J. A. M. Hinke, and Constance L. Friedman* 286
OBSERVATIONS ON BLOOD VESSELS AND EXERCISE ... *Clark E. Brown, T. C. Huang, Edward L. Bortz, and Clive M. McCay* 292
AGING: A THEORY BASED ON FREE RADICAL AND RADIATION CHEMISTRY ... *Denham Harman* 298
GERIATIC PRACTICE: GERIATIC OFFICE GYNECOLOGY ... *John C. Weed* 301
BOOK REVIEWS ... 307

PAGE

Section B—Psychological and Social Sciences, and Social Work and Administration

PROBLEM SOLVING SET IN DIFFERENT AGE GROUPS ..... *Howard J. Heglin* 310
AN AGE DIFFICULTY IN SEPARATING SPATIALLY CONTIGUOUS DATA ..... *Hilary M. Clay* 318
THE EFFECT OF MIGRATION ON THE NUMBER AND DISTRIBUTION OF THE AGED IN FLORIDA ..... *Irving L. Webber* 323
THE ROLE OF WELFARE AGENCIES IN PROVIDING SERVICES TO THE AGED: THE ROLE OF THE PUBLIC AGENCY ..... *Wilbur J. Cohen* 328
AGE AND ACHIEVEMENT: A CRITIQUE ..... *Wayne Dennis* 331
REPLY TO DENNIS' CRITIQUE OF AGE AND ACHIEVEMENT ..... *Harvey C. Lehman* 333
BOOK REVIEWS 338

Section C—Index to Current Periodical Literature

INDEX TO CURRENT PERIODICAL LITERATURE 340

VOLUME 11 OCTOBER, 1956 NUMBER 4

Section A—Biological Sciences and Clinical Medicine

LIFE SPAN AND CAUSES OF DEATH IN INBRED MICE IN RELATION TO DIET ..... *Y. Chiung Puh Lee, Maurice B. Visscher, and Joseph T. King* 364
AGE CHANGES IN THE SWELLING CAPACITY OF HUMAN ACHILLES TENDON ..... *William G. Banfield* 372
THE ALDOLASE ACTIVITY OF AORTIC AND PULMONARY ARTERY TISSUE IN INDIVIDUALS OF VARIOUS AGES ..... *J. E. Kirk and L. B. Sørensen* 373
PULMONARY FUNCTION STUDIES: AGE DIFFERENCES IN LUNG VOLUMES AND BELLOWS FUNCTION ..... *Arthur H. Norris, Nathan W. Shock, Milton Landowne, and Joseph A. Falzone, Jr.* 379
AGE AND THE RATIO T_mPAH/T_m DIODRAST IN MAN WITH A NOTE ON THE SELF-DEPRESSION OF T_m DIODRAST ..... *Irwin Stoloff, Donald M. Watkin, and Nathan W. Shock* 388
AGING AND THE LATENCY AND DURATION OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT AND SOUND STIMULI ..... *Lillian S. Kumnick* 391
GERIATRIC PRACTICE: THE CONTROL OF ARTERIAL HYPERTENSION IN OLDER INDIVIDUALS ..... *Henry A. Schroeder* 397
BOOK REVIEWS 402

Section B—Psychological and Social Sciences, and Social Work and Administration

RELATIONSHIPS AMONG WECHSLER, WEIGL, RORSCHACH, EEG FINDINGS, AND ABSTRACT-CONCRETE BEHAVIOR IN A GROUP OF NORMAL AGED SUBJECTS ..... *Margaret Thaler* 404
AN ATTEMPT TO USE PRODUCTION DATA IN THE STUDY OF AGE AND PERFORMANCE ..... *H. F. King* 410
A STUDY OF PERFORMANCE IN RELATION TO AGE AT TWO PRINTING WORKS ..... *Hilary M. Clay* 417
BOOK REVIEWS 425

Section C—Organization Section and Index to Current Periodical Literature Author Index to Current Periodical Literature, Index to Volume 11

ORGANIZATION SECTION: PROGRAM OF THE NINTH ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. 428
ABSTRACTS OF SCIENTIFIC PAPERS TO BE PRESENTED 435
FELLOWS AND MEMBERS OF THE GERONTOLOGICAL SOCIETY, INC. 451
INDEX TO CURRENT PERIODICAL LITERATURE 459
AUTHOR INDEX TO CURRENT PERIODICAL LITERATURE 487
INDEX TO VOLUME 11 500

PAGE
on
eglin 310
Clay 318
ebber 323
ENCY.....
ohen 328
ennis 331
man 333
..... 338
..... 340
UMBER 4
King 364
field 372
nsen 373
e, Jr. 379
RAST
hock 388
MULI.....
nick 391
eder 397
..... 402
n
R IN
naler 404
King 410
Clay 417
..... 425
ICAL
..... 428
..... 435
..... 451
..... 459
..... 487
..... 500

JOURNAL OF GERONTOLOGY

VOLUME 11, NUMBER 4
OCTOBER, 1956

Section A

Biological Sciences and Clinical Medicine

JOURNAL OF GERONTOLOGY

VOLUME 11, SECTION A OCTOBER, 1956 NUMBER 4

LIFE SPAN AND CAUSES OF DEATH IN INBRED MICE IN RELATION TO DIET

Y. CHIUNG PUH LEE, PH.D., MAURICE B. VISSCHER, M.D., PH.D., AND JOSEPH T. KING, M.D., PH.D.

(From the Department of Physiology, University of Minnesota Medical School, Minneapolis)

This report presents the results of experiments designed to observe life span and the causes of death in inbred C_3H male mice as influenced by a number of variables in a semi-purified diet, such as quantitative or qualitative changes of minerals, fats, carbohydrates, and vitamins with special reference to vitamin E and vitamin B_{12}. The observations here reported indicate that under well controlled conditions the life span and causes of death of C_3H strain mice can be controlled by the dietary regimen.

Mice on a semi-purified diet containing a modified Jones-Foster (J-F) salt mixture developed a metabolic disorder in old age which terminated in "heart failure." The metabolic dysfunction can be delayed and the incidence reduced by caloric restriction alone or supplementation with vitamin E. Vitamin B_{12} supplementation apparently also delays the onset of the disorder.

Fatal convulsions accounted for many deaths at about a year of age on certain diets. Caloric restriction or vitamin B_{12} was effective in preventing or delaying convulsive deaths while a hydrogenated vegetable fat (Crisco) diet was associated with a high incidence of fatal convulsive seizures. Leukemia, hepatoma, and myocardial disease were the main causes of death of the older mice.

MATERIALS AND METHODS

Two hundred and fifty inbred C_3H male mice were selected at weaning and separated into 14 groups matched as evenly as possible for age and weight. They were individually housed in a room maintained at 80 ± 2 F. The administration of diets and conditions of the environment were the same as reported previously (8). The various diets were formulated on the basis of modification in our diet C (8). One constituent was varied at a time, as will be specified in the tables presented below. The diet used for caloric restriction was to supply the same level of protein, minerals, and vitamins as the average ad libitum intake on the basal diet, but only two-thirds as many calories. A low fat diet was made by replacing the fat with glucose in equivalent calories. The various diets were prepared, as far as the basic materials are concerned, each time from the same batches supplied by the manufacturers. The diet was stored in glass bottles and kept in a refrigerator at –20 C. until used. No food remained at room temperature for more than one week, which was the interval between change of food cups, except in the caloric restricted groups which were fed measured quantities daily. Body weight and food intake were measured weekly.

Clinical observations were made daily or oftener on all mice. In order to determine the number of mice dying from convulsions, observations were made especially frequently after weighing or changing of cages, in addition to the daily routine. In many cases deaths were observed, and if not, the animals were found shortly after death and autopsies were performed immediately. When animals were about to die, they were anesthetized and autopsied. Histologic studies were made on some organs.

Submitted for publication May 28, 1956.

This investigation was supported in part by a grant, No. H 518, from the National Institutes of Health, Public Health Service, and the Minnesota Division of the American Cancer Society.

RESULTS

Growth, Food Intake, and Times of Death on the Various Diets.

Growth—The growth curves in terms of body weight of groups on the 8 diets tested are shown in figure 1. To avoid crowding the weights of the groups on Amigel, high yeast and alfalfa were omitted. It is not clear whether the low rate of gain in weight of the group on Fox Chow is due to a smaller total caloric intake or to a low growth efficiency, since the calorie value of Fox Chow has not been determined in the present experiment. Mice given supplements of vitamin B_{12} or Animal Protein Factor attained a greater mean weight than the controls, while mice on a modified Hubbell-Mendel-Wakeman (H-M-W) salt mixture showed a smaller body weight. A smaller body weight was also noted in the group on a low fat diet, although the caloric consumption averaged over a period of 3-52 weeks was not significantly different from the control. Caloric restriction drastically retarded the body weight gain. The retardation of the growth of the group on a vitamin E deficient diet was noted only after 18 weeks of age (figure 2). Similarly the greater weight of the groups on high vitamin E, vitamin B_{12} or Animal Protein Factor and the smaller weight gain of the group on a diet containing a modified H-M-W salt was also noted, not during the rapid growth phase, but after 15-18 weeks of age.

Food Intake—The mean food intakes of the groups at different age periods are given in table 1. Generally there was no difference in food consumption at various periods of life except during the first two weeks. No significant decrease of food intake in old age was seen in the healthy animals. This might be due to the fact that there was not much difference in their activity from early life to old age, since the mice were confined in small cages throughout life.

Times of Death—Table 2 shows the percentage of mice living at different ages on various diets. Since all mice were of an inbred stock, the environmental conditions were well controlled, and few mice died from undetermined causes, the difference in percentages of survivors in various groups may probably be considered as nutritional effects. The percentage of animals living to the later ages in the group under caloric restriction, even with Vitamin E deficiency, was superior to any other group.

Cause of Death and Life Span

There were no deaths from infectious diseases at early ages in any of the 14 groups. Only 1 out of 250 mice died at about 6 months without clinical symptoms or significant findings at the postmortem examination. The percentages of mice dying from different causes are shown in table 3. Convulsive seizures accounted for most deaths before 400 days of age. Besides convulsive deaths and a few unde-

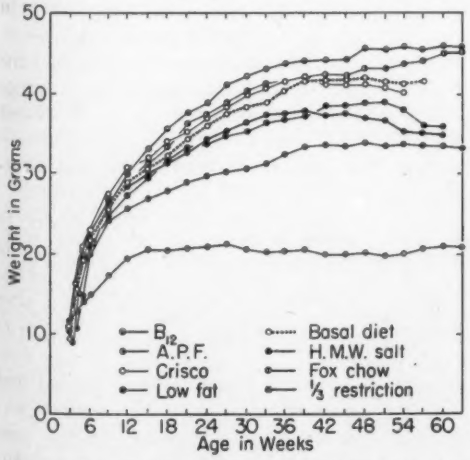


Fig. 1. Mean body weights of C₃H male mice under several dietary regimens.

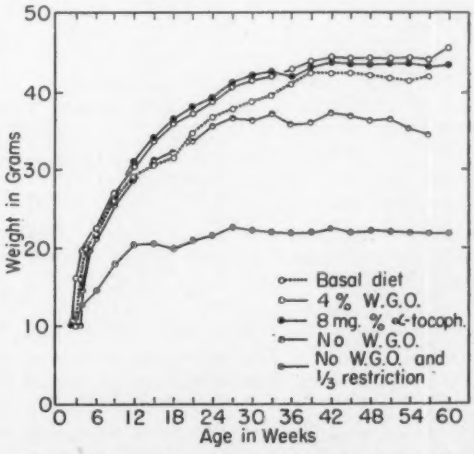


Fig. 2. Mean body weights of C₃H male mice on diets containing different levels of vitamin E and caloric restriction.

TABLE 1. AVERAGE FOOD INTAKE PER DAY AT DIFFERENT AGES OF C_3H MALE MICE ON VARIOUS DIETS.

Diets*	Age (Weeks)							
	4–5	6–10	11–20	21–30	31–40	41–50	3–52	
	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Cal.
A. Basal†	2.47	2.79	2.66	2.61	2.52	2.69	2.64	12.40
B. H-M-W Salt	2.40	2.68	2.66	2.68	2.59	2.74	2.67	12.00
C. Crisco	2.21	2.62	2.67	2.63	2.57	2.68	2.61	12.08
D. Low Fat (2% Lard)	3.24	4.05	3.15	3.04	2.99	3.08	3.23	12.34
E. Amigel	2.33	2.71	2.67	2.52	2.52	2.64	2.64	12.02
F. Fox Chow	—	—	—	—	—	—	—	—
G. ⅓ Caloric Restriction	1.00	2.00	2.00	2.00	2.00	2.00	2.00	8.56
H. High Yeast and Alfalfa	2.53	2.86	2.60	2.55	2.60	2.60	2.65	12.21
I. 4% Wheat Germ Oil	2.56	3.00	2.70	2.59	2.70	2.81	2.73	12.61
J. 8 mg. % α-Tocopherol Acetate	2.35	2.82	2.66	2.65	2.74	2.57	2.73	12.61
K. 0.5% Animal Protein Factor	2.35	2.55	2.61	2.67	2.69	2.65	2.64	12.21
L. 6 γ % Vitamin B_{12}	2.34	2.69	2.67	2.74	2.66	2.64	2.67	12.35
M. Without Wheat Germ Oil	2.23	2.62	2.33	2.24	2.37	2.39	2.48	11.48
N. Without Wheat Germ Oil; ⅓ Caloric Restriction	2.00	2.00	2.00	2.00	2.00	2.00	2.00	8.56

* Except the salt specified, a modified J-F salt mixture was used.

† Glucose 34.02, lard 17.53, casein 28.87, Brewers yeast 8.25, alfalfa leaf meal 4.12, salt 4.12, cod liver oil 2.06, wheat germ oil 1.03, per cent.

termined or doubtful convulsive deaths, myocardial degeneration became the main apparent cause of death at the later ages. There were a few mice which died from undetermined causes after 8 months. Those deaths might have been caused by a lung disease, which is difficult to identify in animals found dead. There were about 20 older mice in which death could not be attributed to a single cause. Most of them had abnormal conditions in lungs, kidneys, liver, or several other organs. Hepatomegaly, jaundice, and amyloidosis were observed occasionally. Leukemia or enlargement of the mesenteric nodes was a common finding in old mice. However, death from lung tumors has not been noted frequently in C_3H male mice, although it is a common cause of death in old strain A mice on a similar experimental regimen. There were only two cases of death apparently due to lung tumors in the present

TABLE 2. SOME DIETARY EFFECTS ON THE LIFE EXPECTANCY OF C_3H MALE MICE.
(% OF MICE LIVING AT DIFFERENT AGES)

Diets*	Age in Weeks																							
	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136
A. Basal†	95	95	90	70	65	50	40	30	10	0															
B. H-M-W Salt	95	90	85	75	70	65	50	40	30	25	25	25	15	15	10	10	10	5	5	5	0				
C. Crisco	75	55	35	20	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0				
D. Low Fat (2% Lard)	95	75	70	65	50	45	30	15	15	10	5	0													
E. Amigel	90	80	75	65	50	35	10	0																	
F. Fox Chow	95	90	85	80	70	60	45	40	35	35	35	35	20	20	20	20	15	15	10	5	5	5	5	0	
G. ⅓ Caloric Restriction	100	95	90	90	90	85	80	75	75	75	75	75	65	65	65	65	65	60	55	55	40	25	25	10	0
H. High Yeast and Alfalfa	90	70	70	70	40	20	10	0																	
I. 4% Wheat Germ Oil	80	70	70	70	70	60	50	50	40	30	30	20	10	0											
J. 8 mg. % α-Tocopherol Acetate	80	70	70	70	70	50	50	40	40	30	30	20	20	10	0										
K. 0.5% Animal Protein Factor	90	90	90	90	90	85	65	55	15	0															
L. 6 γ % Vitamin B_{12}	100	100	100	100	100	100	95	90	75	65	45	30	10	0											
M. Without Wheat Germ Oil	95	90	75	50	40	35	10	0																	
N. Without Wheat Germ Oil; ⅓ Caloric Restriction	95	95	95	95	95	95	95	95	95	95	95	90	75	65	30	0									

*Except the salt specified, a modified J-F salt mixture was used.

† Glucose 34.02, lard 17.53, casein 28.87, Brewers yeast 8.25, alfalfa leaf meal 4.12, salt 4.12, cod liver oil 2.06, wheat germ oil 1.03, per cent.

TABLE 3. PERCENTAGE OF MICE DYING FROM DIFFERENT APPARENT CAUSES AND LIFE SPAN ON VARIOUS DIETS.

Diets*	Causes of Death (in %)						Undetermined Causes (in %)		Life Span (Over-all (Days)		Life Span Eliminating Convulsive Deaths (Days)	
	Convulsion	Heart Failure Syndrome	Hepatoma	Leukemia	Lung Tumor	Misc. Causes	Before 7 mo.	After 7 mo.	Mean Age	Range	Mean Age	Range
A. Basal†	55	40	0	0	0	0	0	5	428.4	267-530	484.5	408-530
B. H-M-W Salt	60	0	20	0	5	15	0	0	477.3	270-821	577.4	409-821
C. Crisco	90	0	5	0	0	5	0	0	332.6	183-790	605.5	421-790
D. Low Fat (2% Lard)	55	25	0	10	0	5	0	5	411.3	236-587	493.0	398-587
E. Amigel	40	55	0	0	0	0	5	0	380.2	203-488	411.0	303-488
F. Fox Chow	45	0	15	15	5	5	0	15	544.5	390-898	616.7	452-898
G. ½ Caloric Restriction	15	25	5	15	0	40	0	0	702.8	304-925	764.7	538-925
H. High Yeast and Alfalfa	30	50	0	0	0	10	0	10	375.0	276-513	380.6	276-513
I. 4% Wheat Germ Oil	50	20	0	0	0	20	0	10	449.0	247-666	565.6	418-666
J. 8 mg. % α-Tocopherol Acetate	50	10	10	10	0	10	0	10	435.8	242-698	556.0	455-698
K. 0.5% Animal Protein Factor	25	70	0	0	0	0	0	5	450.1	241-524	467.1	241-524
L. 6 γ % Vitamin B_{12}	10	70	0	0	0	15	0	5	538.5	432-625	547.3	440-625
M. Without Wheat Germ Oil	25	65	0	0	0	5	0	5	375.2	255-485	377.3	255-485
N. Without Wheat Germ Oil; ½ Caloric Restriction	0	95	0	0	0	0	0	5	625.7	257-686	625.7	257-686

* Except the salt specified, a modified J-F salt mixture was used.

† Glucose 34.02, lard 17.53, casein 28.87, Brewers yeast 8.25, alfalfa leaf meal 4.12, salt 4.12, cod liver oil 2.06, wheat germ oil 1.03, per cent.

experiment, 1 in the group on a modified H-M-W salt, and the other in the group on Fox Chow, both occuring late, namely at 821 and 719 days, respectively. Small lung tumors found in mice dying of other diseases, however, were not uncommon autopsy findings.

In regard to the length of life it is obvious that the group on caloric restriction had the longest mean life span. This confirms the findings by McCay and associates (11) in the rat, by Ball and associates (2) in strain A mice, and by King and Visscher (5) in C_3H mice. However, it is remarkable that the life span of the group under caloric restriction superimposed upon a vitamin E-deficient diet was not only longer than that of their litter mates on a full-fed and vitamin E-deficient diet but also longer than that of the group on a basal diet. On the other hand, the longevity of the full-fed group on a vitamin E-deficient diet was shorter than the control. This difference has a probability of 0.02 of occurring by chance. The group on the high vitamin E diet showed an increase in average life span, eliminating convulsive deaths, but it does not have the same statistical validity because of small numbers. The life span of the group on Fox Chow or vitamin B_{12} is significantly longer than the control. The probability ratio is less than one in one hundred. The average life of the group on a modified H-M-W salt was slightly longer than the control, but the difference is not statistically significant. This is because of the wide spread of ages at death in the former group. Nevertheless the upper level of the life span of the group on a modified H-M-W salt was by far higher than that of the control.

Observation on the "Heart Failure Syndrome"

It has been found that when mice were fed the basal diet containing a modified J-F salt mixture they suffered a typical myocardial degeneration late in life. This is a type of diet-induced metabolic disorder in mice. It has been noted not only in the present experiment on C_3H male mice but also in females of the same strain (9, 12) and in both males and females of strain A mice on the same diet.

The symptoms became apparent only shortly before death. The mouse became inactive. Labored breathing and general edema with or without ascites were the typical symptoms. In most cases exophthalmos developed and sometimes the cornea of the eye became opaque. At a later stage the animal lost appetite and the paws and body were cold to the touch. Sometimes the ascites became hemorrhagic. Frequently passive congestion of viscera was seen, especially of the liver. Hepatization of the lungs was also common. In some cases in the last stages, particularly in mice on a diet containing no wheat germ oil, hemorrhages of the

TABLE 4. SOME DIETARY EFFECTS ON THE INCIDENCE OF "HEART FAILURE SYNDROME."

Diets*	"Heart Failure" % in Mice Alive at 13 Months	Age at Death (Days)	
		Mean Age	Range
A. Basal†	61.5	494.1	440 -530
B. H-M-W Salt	0	——	——
C. Crisco	0	——	——
D. Low Fat (2% Lard)	38.5	490.6	433 -587
E. Amigel	91.7	431.7	392‡-488
F. Fox Chow	0	——	——
G. ⅓ Caloric Restriction	27.8	895.6	855 -925
H. High Yeast and Alfalfa	100.0	414.0	357‡-513
I. 4% Wheat Germ Oil	33.3	607.0	598 -616
J. 8 mg. % α-Tocopherol Acetate	16.7	698.0	——
K. 0.5% Animal Protein Factor	77.8	483.2	426 -524
L. 6 γ % Vitamin B_{12}	82.0	570.5	516 -625
M. Without Wheat Germ Oil	100.0	398.4	299‡-485
N. Without Wheat Germ Oil; ⅓ Caloric Restriction	100.0	645.1	581 -686

‡ Some had "heart failure syndrome" before 13 months.
* Except the salt specified, a modified J-F salt mixture was used.
† Glucose 34.02, lard 17.53, casein 28.87, Brewers yeast 8.25, alfalfa leaf meal 4.12, salt 4.12, cod liver oil 2.06, wheat germ oil 1.03, per cent.

capillaries in the fatty tissues in the intestinal wall and the testes were noted. Small blood clots were sometimes found on the peritoneal or other fatty issues. The heart was greatly dilated, with both auricles and ventricles involved. The left auricle was regularly larger than the right. On the wall of the former white or brownish streaks or small areas, which produced an uneven surface, were found in every case. The heart was more flabby than normal. Pleural fluid was always seen. It was clear, turbid, or occasionally milky, and sometimes contained red blood cells. The degeneration of muscle fibers involved all parts of the heart. The left auricle was by far the most severely affected. A focal or diffuse fibrosis was the typical picture and necrotic patches were found in the left auricle at the later stages. The histopathologic studies will be reported in more detail in another publication.

The incidence of "heart failure" and the average age at death in various groups are presented in table 4. Because of the relatively high death rate from convulsions in many groups we have calculated the percentage incidence of heart failure only from animals living at 13 months. This seems proper because in most diet groups (except H and M) the earliest age at which mice died from myocardial degeneration was later than 13 months, and because the frequency of fatal convulsions decreased in old age.

As shown in table 4, in the group on a diet made with a modified J-F salt mixture 61.5 per cent of mice died from "heart failure" at a mean age of 494 days; the oldest one lived 530 days. When 4 per cent of the modified J-F salt in the basal diet was replaced by 7 per cent of a modified H-M-W salt mixture and fed, the "heart failure" syndrome was not seen.

When the salt mixture was maintained the same as the control but vitamin E was added either as 8 mg. per cent of alpha tocopherol acetate or as 4 per cent wheat germ oil, the incidence of "heart failure" was reduced and the age at death was increased. On the contrary, when the wheat germ oil was removed from the control diet and replaced by an equal amount of lard all animals except those dying from convulsions exhibited myocardial degeneration. A protective effect of vitamin E can be seen clearly when the two caloric restricted groups G and N are taken into consideration. In group N without wheat germ oil, 100 per cent of the mice alive at 13 months died from "heart failure" at a mean age of 645 days, while in group G with 1 per cent wheat germ oil only 27.8 per cent of the mice showed such pathology at death at a mean age of 896 days. The time between the onset of symptoms and death was shorter in the group without wheat germ oil, either on full-feeding or on caloric restriction.

From table 4, it can also be seen that vitamin B_{12} seems to retard the appearance of myocardial degeneration, but the ultimate incidence was not influenced. The age at death was significantly different from the control ($p < 0.01$). The mean ages at death were 571 (516-625) days and 494 (440-530) days in the B_{12} and the control group, respectively. A low fat diet may offer some slight protection against heart muscle degeneration as indicated in a reduction in the frequency but not in delaying the time of onset of the disorder. The differences however, are not statistically significant.

Observations on Convulsive Deaths

A high incidence of convulsive disease was noted in C_3H male mice singly housed in the present experiment. In most groups, except those under caloric restriction or on a diet with

extra vitamin B_{12} added, 30 per cent or more showed convulsions. Vitamin B_{12} or caloric restriction reduced the incidence of convulsive death. A diet containing a hydrogenated vegetable oil as fat supplement was associated with an increased rate of convulsive death and reduced age at onset (10).

Observations on Hepatoma Incidence

The incidence of hepatoma and the average age at which hepatoma was noted is presented in table 5. Hepatoma is not an important cause of death in the present study because of the dominant role of "heart failure" in later life in many groups. When an animal has reached old age, the chance of dying from hepatoma is considerably increased. However, in the caloric restricted groups, animals lived a very long time but very few died from hepatoma or showed evidence of it at autopsy. This is in agreement with the observations of Tannenbaum and Silverstone (13) and Andervont (1). The low incidence of hepatoma in the group on the low fat diet is suggestive, but not conclusive, evidence that the spontaneous hepatoma incidence might be related to a high fat diet. It is also noted that the group on a hydrogenerated vegetable fat showed the highest incidence of liver tumor, 14 out of 20 mice dying at an average of 308 days with hepatoma. The difference from the control is significant at the 1 per cent level, in agreement with Jardetzky and associates (4).

Observations on the Spontaneous Adenoma of the Adrenal Cortex

Adenoma of the adrenal cortex has been observed in several inbred stocks of mice following ovariectomy (3, 17). Spontaneous adenoma of the adrenal cortex in non-castrated animals at advanced ages has been observed only in NH stock females (Minnesota subline) by Kirschbaum and his associates (7). According to their report there are very rare cases of spontaneous cortical adenoma in males of the NH strain mice. In the present study on C_3H male mice spontaneous adenoma of the adrenal cortex has been noted in many mice surviving to old age. Although the age of occurrence varies with individuals it was frequently seen in animals dying after 16 months in full-fed groups and much later in the caloric restricted ones. The histologic structure is comparable to that described by Woolley (17) and Woolley and associates (16) and Kirschbaum and associates (7) in castrated mice. However there is a quantitative difference, as the spontaneous adenoma of the C_3H male mice is not as large as that seen in the castrated mice.

TABLE 5. SOME DIETARY EFFECTS ON THE INCIDENCE OF HEPATOMA.

Diets*	Hepatoma Apparent Cause of Death		Incidence of Hepatoma in Mice Dying of All Causes (%)	Over-All Life Span (Days)
	%	Age at Death (Days)		
A. Basal†	0	——	25	428.4
B. H-M-W Salt	20	530.3	50	477.3
C. Crisco	5	400.0	70	332.6
D. Low Fat (2% Lard)	0	——	10	411.3
E. Amigel	0	——	30	380.2
F. Fox Chow	15	634.7	35	544.5
G. ½ Caloric Restriction	5	715.0	5	702.8
H. High Yeast and Alfalfa	0	——	30	375.0
I. 4% Wheat Germ Oil	0	——	20	449.0
J. 8 mg. % α-Tocopherol Acetate	10	512.0	30	435.8
K. 0.5% Animal Protein Factor	0	——	25	450.1
L. 6 γ % Vitamin B_{12}	0	——	55	538.5
M. Without Wheat Germ Oil	0	——	25	375.2
N. Without Wheat Germ Oil; ½ Caloric Restriction	0	——	5	625.7

* Except the salt specified, a modified J-F salt mixture was used.

† Glucose 34.02, lard 17.53, casein 28.87, Brewers yeast 8.25, alfalfa leaf meal 4.12, salt 4.12, cod liver oil 2.06, wheat germ oil 1.03, per cent.

DISCUSSION

This study was made to obtain as complete information as possible about the causes of death on various modifications of a simple basal diet. The experiment was complicated by an unexpectedly high incidence of convulsive seizures which were frequently fatal. The relationship between conditions of caging and convulsive frequency in C_3H mice has been observed more extensively since this study was made and reported in another publication (6). In brief, the subsequent studies showed that spontaneous convulsions occur with great frequency only when C_3H mice are housed one to a cage. This experiment was the first in which large numbers of C_3H male mice of the subline employed were studied under conditions of single caging. The results are being reported in spite of the defect resulting from many convulsive deaths because we know of no other comparable study in which nearly complete clinical and autopsy data have been

reported using inbred mice and as large a number of dietary variants.

From table 3 it will be apparent that in this series of experiments, deaths from convulsions ranged from zero in the calorie restricted Vitamin E-deficient group to 90 per cent in the hydrogenated vegetable fat group. The low incidence of convulsions in the calorie restricted groups was not because of early death, since the mice on simple calorie restriction had the longest life spans of any group, and additional vitamin E deficiency did not cause much mortality until 88 weeks of life. In fact these two dietary regimens were the only ones in which the average life span exceeded that on commercial Fox Chow (Purina). Several dietary regimens protected against convulsive death, notably vitamin B_{12} supplementation and caloric restriction.

In the groups of animals in which early convulsive deaths did not vitiate the study of causes of death at older ages it will be noted that the deaths from "heart failure" did not occur with the modified H-M-W salt mixture, which contained ferric phosphate rather than ferrous sulphate and lacked the added trace elements found in the J-F formula. Since added alpha-tocopherol greatly reduces heart pathology with the J-F salt it is probable that vitamin E deficiency is a factor in its genesis. One finds it difficult, however, to explain in any simple way the relation of the ferrous and ferric iron to it. Waddell and Steenbock (14, 15) found that ferric chloride could destroy vitamin E activity, presumably by oxidation. However, the conditions of treatment were not the same as those employed in these experiments. Furthermore, the differences in solubility and ionizability of ferric and ferrous salts used may be the determining factor controlling their effects, either upon the stored diet or upon the animal itself. The mechanism of this effect is being explored further, as is the role that the trace elements in the J-F salt may play. The protective effect of simple caloric restriction in relation to myocardial damage is striking, but also unexplained.

SUMMARY

Fourteen dietary regimens have been studied, using inbred C_3H male mice from weaning throughout life. The observations seem to indicate that under well controlled conditions the life span and the cause of death of the inbred C_3H strain mice can be modified markedly by the dietary regimen.

Mice on a semi-purified diet containing a modified Jones-Foster salt mixture developed a metabolic disorder in old age which terminated in a "heart failure syndrome." The metabolic dysfunction can be delayed and the incidence reduced by caloric restriction alone. Increasing the amount of vitamin E in the full-feeding diet also reduced the incidence of "heart failure" and delayed the onset. Vitamin B_{12} postponed the age of appearance of the metabolic disorder.

Fatal convulsive seizures accounted for many deaths at middle-age. This was found to be partially associated with the dietary regimen. Caloric restriction and vitamin B_{12} seemed effective in preventing or delaying convulsive deaths, while a Crisco-diet induced a high incidence of fatal convulsions.

REFERENCES

1. Andervont, H. B.: Studies on the Occurrence of Spontaneous Hepatomas in Mice of Strains C_3H and CBA. *J. Nat Cancer Inst., 11:* 581-592, 1950.
2. Ball, Z. B., Barnes, R. H., and Visscher, M. B.: The Effects of Dietary Caloric Restriction on Maturity and Senescence with Particular Reference to Fertility and Longevity. *Am. J. Physiol., 150:* 511-519, 1947.
3. Gardner, W. U.: Estrogenic Effects of Adrenal Tumors of Ovariectomized Mice. *Cancer Research, 1:* 632-637, 1944.
4. Jardetzky, O., Visscher, M. B., and King, J. T: Development of Spontaneous Hepatoma in Mice in Relation to Composition of Dietary Fat. *Proc. Soc. Exper. Biol. & Med., 90:* 648-650, 1955.
5. King, J. T., and Visscher, M. B.: Longevity as a Function of Diet in the C_3H Mouse. *Federation Proc., 9:* 70, 1950.
6. King, J. T., Lee, Y. C. P., and Visscher, M. B.: Single Versus Multiple Cage Occupancy and Convulsion Frequency in C_3H Mice. *Proc. Soc. Exper. Biol. & Med., 88:* 661-663, 1955.
7. Kirschbaum, A., Frantz, M., and Williams, W. L.: Neoplasm of Adrenal Cortex in Non-Castrate Mice. *Cancer Research, 6:* 707-711, 1946.
8. Lee, Y. C. P., King, J. T., and Visscher, M. B.: Caloric Intake and Fertility in C_3H Male Mice. *Am. J. Physiol., 167:* 375-378, 1951.
9. Lee, Y. C. P.: Unpublished data.
10. Lee, Y. C. P., Jardetzky, O., King, J. T., and Visscher, M. B.: Some Dietary Effects on the Incidence of "Spontaneous" and Induced Convulsions in C_3H Male Mice. To be published.
11. McCay, C. M., Maynard, L. A., Sperling, G., and Barnes, L. L.: Retarded Growth, Life Span, Ultimate Body Size and Age Changes in the Albino

Rat After Feeding Diets Restricted in Calories. *J. Nutrition, 18:* 1-13, 1939.

12. Newberry, T. A.: The Effects of Graded Caloric Restriction upon Certain Endocrine and Target Organs in Relation to Mouse Mammary Carcinoma. Ph.D. Thesis, University of Minnesota, 1953.
13. Tannenbaum, A., and Silverstone, H.: The Influence of the Degree of Caloric Restriction on the Formation of Skin Tumors and Hepatomas in Mice. *Cancer Research, 9:* 724-727, 1949.
14. Waddell, J., and Steenbock, H.: The Destruction of Vitamin E in a Ration Composed of Natural and varied Foodstuffs. *J. Biol. Chem., 80:* 431-442, 1928.
15. Waddell, J., and Steenbock, H.: Vitamin E in Iron Treated Dry Rations. *J. Nutrition, 4:* 79-93, 1931.
16. Woolley, G., Fekete, E., and Little, C. C.: Differences Between High and Low Breast Tumor Strains of Mice When Ovariectomized at Birth. *Proc. Soc. Exper. Biol. & Med., 45:* 796-798, 1940.
17. Woolley, G., Fekete, E., and Little, C. C.: Effect of Castration in the Dilute Brown Strain of Mice. *Endocrinology, 28:* 341a-344a, 1941.

AGE CHANGES IN THE SWELLING CAPACITY OF THE HUMAN ACHILLES TENDON

WILLIAM G. BANFIELD, M.D.

(From the National Institutes of Health, Bethesda, Maryland, and the Department of Pathology, Yale University School of Medicine, New Haven, Connecticut)

In a report on age changes in collagen from human tissues (1), it was stated that there was swelling of human Achilles tendon in dilute acetic acid in the younger age groups and that swelling was almost absent above the age of 65. This observation has now been extended with a large number of specimens and more exact measurements.

MATERIALS AND METHODS

Human Achilles tendons were obtained from 277 individuals during unselected routine autopsies. Two-tenths Gm. of tendon from each individual was placed in 5 cc. of 1:1000 dilution of acetic acid and allowed to stand for 24 hours in the refrigerator. At the end of this time the specimen was dried by blotting and again weighed. This weight was taken as a measure of the swelling.

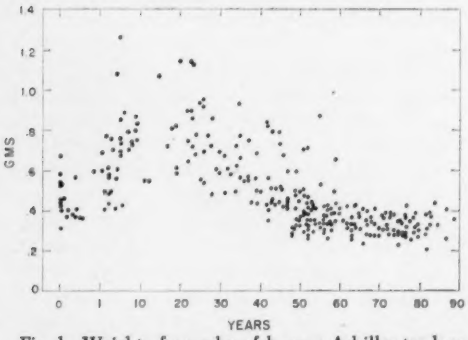


Fig. 1. Weight of samples of human Achilles tendons from individuals of various ages after 24 hours in 1:1000 dilution of acetic acid at refrigerator temperature. Starting weight 0.2 Gm.

RESULTS

The final weights of the tendons were plotted against age (fig. 1). The acid-swelling capacity increases up to the approximate age of 26. In general above 26 years of age the tendons swell less as age increases, and after 60 years of age there is very little swelling.

The acid-swelling capacity of two tendons was much greater than others in their age group. One was from a 4-year-old boy who died of acute lymphatic leukemia and who had an increased intracranial pressure for 4 months before death; the other was from a 5-year-old girl who died of a cerebromacular degeneration.

Submitted for publication May 11, 1956.

This investigation was supported in part by two research grants (USPHS C383 (C5) and USPHS C1886 M&G) from the National Cancer Institute, of the National Institutes of Health, Public Health Service.

DISCUSSION

A well-defined change takes place in the human Achilles tendon during aging. At least part of this change would seem to be in the collagen itself; however, other factors may be involved. Young tendons contain more fibroblasts and vessels in proportion to collagen than old tendons and these elements may act to constrict swelling in the young tendons. Jordan-Lloyd and Marriott (2) have demonstrated a reticular sheath around the tendons of the rat's tail and believe this sheath restricts swelling in 4-6 week old rats, but not in rats which are much older. It has not been demonstrated that such a sheath is present in the human Achilles tendon.

The decrease in the acid-swelling capacity of the human Achilles tendon after 26 years of age, however, would seem to be the result of a change in the collagen itself, since the cellularity or vascularity does not seem to change appreciably after this time. In addition, the older tendons, which show little gain in weight, have a different appearance after exposure to the acid as compared with the younger tendons, even though their increase in weight in acid may be similar. That is to say, the young tendons become turgid and translucent, whereas the old tendons remain opaque and relatively flaccid. Such a difference would not seem to depend upon the presence of a reticular sheath about the collagen bundles unless the sheath were so dense in the older tendons as to prevent the acid from reaching the collagen. This is unlikely since an intact tendon of an old individual which shows almost no increase in weight in acetic acid shows no greater weight increase when exposed to the acid after being broken up in a blendor.

SUMMARY

The acid-swelling capacity of human Achilles tendon obtained at autopsy from 277 individuals was measured as the final weight of 0.2 Gm. samples of tendon following exposure to 1:1000 dilution of acetic acid for 24 hours under refrigeration. In general the acid-swelling capacity of the tendons increased from birth to 26 years of age. After 26 years of age, the acid-swelling capacity decreased until the age of 60, following which there was very little swelling. No satisfactory explanation for the age changes has been found.

REFERENCES

1. Banfield, W.: The Solubility and Swelling of Collagen in Dilute Acid with Age Variations in Man. *Anat. Rec., 114;* 157-172, 1952.
2. Jordan-Lloyd, D., and Marriott, R.: The Swelling of Structured Proteins. The Influence of the Reticular Tissue on the Swelling of Collagen in Water and Hydrochloric Acid. *Proc. Roy. Soc., London, s.B., 118:* 439-445, 1935.

THE ALDOLASE ACTIVITY OF AORTIC AND PULMONARY ARTERY TISSUE IN INDIVIDUALS OF VARIOUS AGES*

J. E. KIRK, M.D., AND L. B. SØRENSEN, M.D.

(From the Division of Gerontology, Washington University School of Medicine, St. Louis)

No reports are as yet available on quantitative measurements of the aldolase activity of vascular tissue. The present study was undertaken with the purpose of determining the aldolase activity of homogenates prepared from the aorta and pulmonary artery from individuals of various ages. In addition, aldolase measurements on a limited number of coronary artery samples were carried out.

METHODS

One hundred and twelve samples of the human aorta (thoracic descending) and 84 samples of the pulmonary artery were obtained fresh at autopsy at the St. Louis City Morgue.† The age of the individuals from whom the samples were derived ranged between 3 weeks and 80 years. Immediately after removal the samples were placed in sterile beakers immersed in crushed ice. After separation of the adventitia the intima-media segment was homogenized in a Pyrex grinder with 9 volumes of distilled water, making a 10 per cent homogenate.

Determination of the aldolase activity of the arterial homogenates was performed at 38 C. and pH 7.2 by a modification of the methods described by Lowry and associates (5) and Sibley and Lehninger (8).

Reagents.—1) Fructose-1,6-diphosphate (HPD) solution, 0.03 M, pH 3.35, prepared from the commercially available barium salt (Nutritional Biochemicals Corp.). Barium was removed from the solution by the addition of the required amount of sodium sulfate. The reagent was prepared fresh every two weeks. 2) Hydrazine solution, 0.56 M, pH 7.2, prepared from hydrazine hydrate. 3) Tris(hydroxymethyl)aminomethane solution, 0.10 M, pH 7.63. 4) Trichloroacetic acid solution, 25 per cent. 5) Sodium hydroxide solution, 0.6 N. 6) 0.1 per cent solution of 2,4-dinitrophenylhydrazine in 2 N hydrochloric acid. An aliquot of this reagent was centrifuged daily before use. 7) Methyl cellosolve (Methylene glycol monomethyl ether)—sodium hydroxide reagent, prepared by mixing 4 volumes of methyl cellosolve with 2 volumes of 1 N sodium hydroxide solution. The reagents were stored in the refrigerator at 4 C. between use.

Procedure.—For each experiment 4 tubes (150 x 25 mm.) were prepared, 2 of which served as blanks. One ml. of HDP solution, 1.0 ml. of hydrazine solution, and 5.0 ml. of tris buffer were pipetted into each tube. A Lang constriction pipette was used for measuring out the HDP solution. The pH of the mixed substrate buffer solution was 7.2. To the two blanks 2.0 ml. of 25 per cent trichloroacetic acid were further added, after which the tubes were preheated in a water bath at 38 C. for 10 minutes. At the start of the experiment 0.5 ml. of homogenate and 0.5 ml. of distilled water were added to 1 of the test samples and to 1 of the blanks, and 1.0 ml. of homogenate to the other test sample and to the other blank. The tubes were allowed to remain in the water bath for exactly thirty minutes. At the end of this period the enzyme activity was stopped in the two test samples by addition of 2.0 ml. 25 per cent trichloroacetic acid solution.

After sedimentation of the precipitated protein 200 cu. mm. of the supernatant of each sample were transferred to a test tube (150 x 25 mm.), and 200 cu. mm. of 0.6 N sodium hydroxide solution were added. Constriction pipettes were used for these transfers. The contents of the tubes were mixed, and the tubes placed in a water bath at 38 C. for exactly 10 minutes. Three hundred cu. mm. of 2,4-dinitrophenylhydrazine solution were then added by means of a constriction pipette, and the contents of the tubes were again carefully mixed. The samples were then left at room temperature for 40 minutes, at the end of which period 6.0 ml. of the methyl cellosolve-sodium hydroxide reagent were added. Following this addition the tubes were again shaken thoroughly. The samples were then left for 30 minutes at room temperature for color development. The color intensity of the samples was measured at 570 millimicrons against the corresponding blanks, using a Coleman No. 14 spectrophotometer. The average analytic error in duplicate determinations on the same trichloroacetic acid supernatant was 2.7 per cent.

Since the identity of the product obtained from triose phosphate in alkali in the presence of hydrazine has not been established a determination of the molar extinction coefficient for the splitting of HDP under the conditions of the procedure used is necessary. In the method employed for such standardization (5) the triose phosphate compounds in the trichloroacetic acid supernatant are converted to methylglyoxal by hydrolysis with hydrochloric acid. The methylglyoxal content of the hydrolysate is measured colorimetrically by reaction with dinitrophenylhydrazine and alkaline methyl cellosolve, using as reference a methylglyoxal solution prepared by acid hydrolysis of a standard solution of dihydroxyacetone. The molar extinction coefficient for the splitting of HDP is then calculated from the color development observed in the unhydrolyzed trichloroacetic acid supernatant and the triose phosphate content of the supernatant, the latter estimated on the basis of the methylglyoxal determination in the hydrolysate of the supernatant.

For methylglyoxal from dihydroxyacetone by this procedure the molar extinction coefficient found in three experiments was 47150, 47150, and 46800; these values are in good agreement with the value of 53000 reported

Submitted for publication June 20, 1956.
* Studies on Arterial Metabolism XIV. The investigation was supported by a grant (PHS-891) from the National Heart Institute of the National Institutes of Health, Public Health Service.
† The authors are indebted to Dr. J. J. Connor for assistance in obtaining specimens.

TABLE 1. ALDOLASE ACTIVITY OF 101 HUMAN AORTIC SAMPLES.

No.	Age (Years)	Sex	Race	Dry Matter, %	Nitrogen, % of Wet Weight	Cholesterol, % of Wet Weight	HDP split, mM/Gm. Wet Tissue/Hour	HDP split, mM/Gm. Tissue N/Hour	Macroscopic Arteriosclerosis
1	0.06	M	W	23.1	3.59	0.17	0.0654	1.82	none
2	0.06	M	W	25.4	3.26		0.0670	2.05	none
3	0.16	M	W				0.0237		none
4	0.60	F	C	31.2	4.31	0.21	0.0664	1.54	none
5	1.5	F	W				0.0203		none
6	3	M	W				0.0407		none
7	3	M	W	36.3	5.17	0.35	0.0593	1.15	none
8	5	M	W	32.5	3.63	0.64	0.0582	1.60	none
9	5	F	C	29.6	4.35	0.75	0.0583	1.34	none
10	6	M	W			0.42	0.0368		none
11	8	F	W	25.0	3.53	0.52	0.0866	2.45	none
		Mean....		29.0	3.99	0.44	0.0530	1.71	
12	10	F	C	35.3	4.75	0.57	0.0516	1.09	none
13	14	M	W	28.5	4.50	0.63	0.0275	0.61	slight
14	14	M	W	28.5	4.48	0.66	0.0305	0.68	slight
15	15	F	C	22.3	3.18	0.60	0.0347	1.09	slight
16	16	M	C	29.8	4.21	0.55	0.0241	0.57	none
		Mean....		28.9	4.22	0.60	0.0337	0.81	
17	21	M	W	27.4	4.32	1.17	0.0382	0.86	slight
18	22	F	C	27.1	4.07	0.36	0.0304	0.75	slight
19	25	M	C	31.0	4.13	1.30	0.0710	1.72	slight
20	25	F	W	31.3	3.65	0.47	0.0812	2.22	slight
21	28	M	C	31.0	4.07	0.77	0.0134	0.33	slight
22	29	M	W	30.2	4.03	0.58	0.0680	1.68	moderate
		Mean....		29.7	4.05	0.78	0.0504	1.26	
23	30	M	C	28.5	3.63	0.49	0.0612	1.69	slight
24	32	F	W	27.5	3.28	1.20	0.0614	1.87	slight
25	33	M	C	26.3	3.30	1.28	0.0688	2.08	slight
26	34	M	W	27.4	3.23	2.09	0.1158	3.58	slight
27	36	M	W	29.1	4.15	0.86	0.0425	1.05	slight
28	37	M	C	29.7	3.87	0.93	0.0376	0.97	slight
29	37	F	W	28.7	3.10	0.76	0.0441	1.42	none
30	38	F	C	29.3	4.30	1.41	0.0574	1.33	moderate
31	38	F	C	27.0	3.43	1.69	0.0761	2.22	moderate
32	39	F	C	30.1	3.81	1.09	0.0602	1.58	slight
		Mean....		28.4	3.61	1.18	0.0625	1.78	
33	40	M	C	26.2	3.40	2.95	0.0698	2.05	moderate
34	40	F	W	28.3	3.71	0.90	0.0555	1.50	none
35	40	F	C	28.0	3.86	0.57	0.0599	1.55	slight
36	41	M	W	29.4	3.49	0.71	0.0780	2.24	moderate
37	42	M	C	26.3	3.14	0.85	0.0775	2.47	moderate
38	42	F	C	25.2	2.85	1.97	0.0595	2.09	moderate
39	43	M	C	24.3	3.21	1.05	0.0655	2.04	slight
40	44	M	W	29.6	3.66	2.07	0.0727	1.99	moderate
41	44	M	W	25.7	3.61	1.41	0.0892	2.47	moderate
42	44	M	C	26.6	3.54	1.57	0.0472	1.33	slight
43	45	M	W	29.0	3.99	1.48	0.0700	1.76	slight
44	46	M	W	27.7	2.39	6.86	0.0505	2.11	severe
45	46	M	C	25.4	3.26	0.64	0.0880	2.70	moderate
46	48	M	C	27.4	3.18	1.01	0.0681	2.14	slight
47	49	M	W	28.5	3.92	0.83	0.0611	1.56	slight
48	49	F	W	28.1	3.45	1.20	0.0950	2.75	slight
49	49	F	W	29.2	3.32	0.85	0.0628	1.89	moderate
		Mean....		27.4	3.41	1.58	0.0688	2.04	
50	50	M	W	26.7	3.39	0.83	0.0098	0.29	moderate
51	50	M	C	30.5	3.90	2.09	0.0668	1.72	severe
52	50	F	W	24.6	3.07	0.60	0.0610	1.99	moderate
53	50	F	C	30.5	3.02	1.01	0.0684	2.26	severe
54	51	M	W	27.7	3.46	1.91	0.0493	1.43	severe
55	51	M	W	27.7	3.32	4.95	0.0636	1.92	severe
56	51	M	C	27.4	3.50	2.14	0.0587	1.68	severe
57	52	M	W	22.8	3.05	1.36	0.1366	4.08	moderate
58	52	M	W	28.2	4.13	2.94	0.0465	1.13	slight
59	53	M	W	30.1	3.43	1.88	0.0189	0.55	slight
60	53	M	W	26.3	3.63	3.29	0.0981	2.71	moderate
61	53	M	W	27.5	3.75	0.81	0.0800	2.13	moderate
62	53	F	W	28.6	3.35	1.31	0.0463	1.38	slight
63	53	F	C	27.8	3.49	1.94	0.1490	4.27	moderate
64	53	F	C	26.9	3.52	1.49	0.0655	1.86	severe
65	53	F	C	28.5	3.46	0.98	0.0164	0.48	slight
66	54	M	W	23.2	3.02	2.08	0.0390	1.29	moderate
67	54	M	W	25.7	3.53	1.28	0.1059	3.00	severe
68	55	M	W	27.0	3.68	1.40	0.0674	1.83	slight
69	55	M	W	29.1	3.85	1.45	0.0534	1.39	slight
70	55	M	W	27.6	3.62	1.16	0.0770	2.13	moderate
71	55	M	W	27.2	3.44	2.00	0.0505	1.47	moderate
72	55	M	W	28.4	3.60	0.85	0.0465	1.29	moderate
73	55	M	C	26.4	3.49	0.87	0.0715	2.05	moderate
74	57	M	W	31.2	3.25	5.12	0.0648	2.00	severe
75	57	M	W	33.3	3.92	1.59	0.0492	1.26	severe
76	57	M	C	25.9	3.03	1.94	0.0576	1.91	moderate
77	58	M	W	28.2	3.80	1.14	0.0413	1.09	none
78	58	M	W	29.7	3.80	1.36	0.0629	1.66	severe
79	58	M	C	28.6	3.57	1.86	0.0717	2.01	moderate
80	58	M	C	30.7	4.07	0.98	0.0676	1.67	slight
81	59	M	C	26.8	3.63	1.19	0.0457	1.26	moderate
82	59	F	W	25.2	2.58	1.15	0.0951	3.69	severe
		Mean....		27.8	3.50	1.73	0.0637	1.85	
83	61	M	W	26.9	3.54	1.16	0.1321	3.73	moderate
84	61	F	W	26.9	3.31	1.04	0.1614	4.88	none
85	61	F	W	26.3	3.53	1.56	0.0780	2.21	moderate
86	62	F	W	27.3	2.84	3.95	0.0475	1.67	severe
87	63	M	W	26.9	3.21	4.95	0.0609	1.90	severe
88	65	M	W	30.2	2.94	4.76	0.0765	2.60	severe
89	65	M	C	30.2	2.01	3.83	0.0548	2.73	severe
90	66	M	W	30.5	3.52	1.41	0.0518	1.47	slight
91	68	M	W	26.5	3.27	1.63	0.0650	1.99	moderate
92	68	F	W	30.5	2.90		0.0867	2.99	severe
93	69	M	W	36.1	3.87	1.19	0.0479	1.24	severe
94	69	M	W	28.3	3.54	2.66	0.0651	1.84	severe
		Mean....		28.9	3.21	2.55	0.0773	2.44	
95	71	M	W	28.0	3.24	0.69	0.0426	1.32	moderate
96	73	F	W	30.3	3.59	5.26	0.0421	1.17	severe
97	76	M	W	34.4	2.46	3.18	0.0634	2.57	severe
98	76	M	W	26.5	3.33	1.32	0.0600	1.80	moderate
99	76	F	W	29.6	3.30	1.93	0.0593	1.80	severe
100	77	F	W	37.1	3.15	3.11	0.0445	1.41	severe
101	80	M	W	27.3	3.44	1.96	0.0642	1.87	moderate
		Mean....		30.5	3.22	2.50	0.0629	1.71	
		Grand Mean..		28.4	3.54	1.59	0.0626	1.79	

by Lowry and associates (5). To establish the molar extinction coefficient for the splitting of HDP 4 experiments were conducted, 2 with a crystalline aldolase preparation (Nutritional Biochemicals Corp.), one with a homogenate of human brain, and one with a homogenate of human aortic tissue. The molar extinction coefficient values found in these experiments were, respectively, 30900, 32400, 29900, and 31600. The average coefficient value of 31200 found for the present method is lower than the value of 58000 reported by Lowry and associates (5); it must be assumed that the difference is due to differences in the aldolase procedures used.

An investigation was made of the relation between the time of incubation and the quantity of HDP split by the tissue. For this purpose an aortic homogenate sample and a blank were incubated at 38 C. with subtrate buffer solution and aliquots removed for analysis after 10, 20, 30, 40, 60, 90, and 120 minutes. The amounts of HDP split /Gm. wet tissue after these incubation periods valued, respectively, 0.0200, 0.0402, 0.0597, 0.0762, 0.1162, 0.1490, and 0.1830 mM. A high degree of proportionality between time and quantity of HDP split by the tissue was thus observed over the first 60-minute period of incubation.

The relation between the amount of tissue in the sample and the quantity of HDP split was evaluated by comparison of the values found in the experiments with 0.5 and 1.0 ml. homogenate of the same arterial samples. The aldolase values for the 0.5 ml. homogenate samples averaged 48.6 per cent of those for the 1.0 ml. samples.

The aldolase activity of arterial tissue maintained in the refrigerator at 4 C. was found to decrease only 5 per cent after 5 days of storage.

In the case of both the aortic and pulmonary artery samples determinations of the dry weight, total nitrogen, and cholesterol content of the tissue were made on a portion of the arterial wall adjacent to that employed for the enzyme studies. The nitrogen analyses were carried out by macro-Kjeldahl procedure. For the cholesterol determinations the procedure of Knobil and associates (4) was used.

RESULTS

Aortic samples.—The results of individual aldolase determinations on 101 aortic samples are presented in table 1. The table further contains the observed dry weight, total nitrogen, and cholesterol values for the samples. In addition, the grading of the samples on the basis of their macroscopic appearance has been included.

The average quantity of HDP split by the 101 aortic samples was 0.0628 mM (21.0 mg.) /Gm. wet tissue/hour. An analysis of the aldolase values observed for the two sexes revealed that the mean enzyme activity of the samples derived from the women was 114 per cent of the values observed for the men in the corresponding age groups. If only the aortic samples from the white subjects are considered an average percentage value for the women of 107 is found.

TABLE 2. MEAN ALDOLASE ACTIVITY OF HUMAN AORTIC AND PULMONARY ARTERY SAMPLES IN VARIOUS DECADES.

Age Group (Years)	Aorta			Pulmonary Artery		
	Number of Samples	mM HDP Split/Hour		Number of Samples	mM HDP Split/Hour	
		Per Gm. Wet Tissue	Per Gm. Tissue N		Per Gm. Wet Tissue	Per Gm. Tissue N
0–9	11	0.0530	1.71	6	0.0863	2.40
10–19	5	0.0337	0.81	3	0.0525	1.49
20–29	6	0.0504	1.26	4	0.0698	1.84
30–39	10	0.0625	1.78	8	0.0771	2.42
40–49	17	0.0688	2.04	15	0.0711	2.20
50–59	33	0.0637	1.85	32	0.0654	1.98
60–69	12	0.0773	2.44	10	0.0785	2.41
70–80	7	0.0629	1.71	3	0.0744	2.50

In the case of 3 aortic samples comparisons were made between the aldolase activities of the ascending aorta, the arch, the descending thoracic portion, and the abdominal aorta. No significant differences in enzyme activities between these sections of the vessel were observed.

The mean aldolase values observed for the various decades are listed in table 2. It will be seen from the table that the average enzyme activity was found to decrease from the 0-9 year group to the 10-19 year group and that the aldolase values for the subsequent decades showed a definite tendency to increase with age till 70 years. A calculation of the coefficient of correlation between age and aldolase activity of the samples from the 10-69 year subjects showed the following values:

Age / quantity of HPD split / Gm. wet tissue:
$r = +0.29$ ($t = 2.72$, $N = 83$)
Age / quantity of HDP split / Gm. tissue N:
$r = +0.36$ ($t = 3.48$, $N = 83$)

An analysis was further made of the correlation between the tissue cholesterol content and the aldolase activity of aortic samples derived from individuals aged 50-59 years. The r value found for this relation was + 0.12 ($t = 0.67$, $N = 33$).

Whereas the enzyme measurements included in table 1 were performed on portions of the aorta showing a degree of arteriosclerosis representative of the descending thoracic aorta as a whole, a special investigation was carried out on 11 additional aortic samples with the purpose of comparing the aldolase activities of ap-

TABLE 3. ALDOLASE ACTIVITY OF 84 SAMPLES OF HUMAN PULMONARY ARTERY.

No.	Age (Years)	Sex	Race	Dry Matter, %	Nitrogen, % of Wet Weight	Cholesterol, % of Wet Weight	HDP split, mM/Gm. Wet Tissue/Hour	HDP split, mM/Gm. Tissue N/Hour	Macroscopic Arteriosclerosis
4	0.60	F	C	32.0	4.41	0.11	0.0390	0.88	none
6	3	M	W	25.0	3.60		0.0675	1.87	none
7	3	M	W	25.9	3.85	0.79	0.0522	1.35	none
8	5	M	W	23.9	2.12	0.38	0.1051	4.96	none
10	6	M	W				0.0438		none
11	8	F	W	22.7	3.03	0.57	0.0895	2.96	none
		Mean....		26.0	3.41	0.46	0.0662	2.40	
12	10	F	C	25.1	3.24	0.32	0.0516	1.59	none
15	15	F	C	21.6	3.61	0.51	0.0347	0.96	none
16	16	M	W	26.3	3.72	0.38	0.0712	1.91	none
		Mean....		24.4	3.52	0.40	0.0525	1.49	
19	25	M	C	29.7	4.24	0.40	0.0739	1.74	none
20	25	M	W	24.9	3.71	0.27	0.1044	2.81	none
21	28	M	C	29.6	3.94	0.32	0.0226	0.58	none
22	29	M	W	24.1	3.53	0.38	0.0782	2.22	none
		Mean....		27.1	3.85	0.34	0.0698	1.84	
23	30	M	C	25.3	3.62	0.48	0.0746	2.06	none
25	33	M	C	22.6	3.05	0.67	0.0951	3.12	none
26	34	M	W	27.4	3.59	0.89	0.1037	2.89	none
27	36	M	W	16.1	1.70	0.29	0.0480	2.82	none
28	37	M	C	23.8	3.56	0.36	0.0682	1.92	none
30	38	F	C	26.9	3.53	0.44	0.0901	2.55	none
31	38	F	C	25.7	3.25	0.26	0.0672	2.07	none
32	39	F	C	27.4	3.67	0.39	0.0698	1.91	none
		Mean....		24.4	3.25	0.47	0.0771	2.42	
33	40	M	C	19.5	2.67	0.50	0.0545	2.04	moderate
34	40	F	W	26.6	3.56		0.0353	0.99	none
35	40	F	C	27.4	3.88	0.45	0.0715	1.84	slight
36	41	M	W	28.0		0.68	0.0828		moderate
37	42	M	C	24.7	3.44	0.35	0.0806	2.34	slight
39	43	M	C			0.93	0.0648		slight
41	44	M	W	23.5	3.42	0.53	0.0806	2.36	none
42	44	M	C	24.6	3.44	0.71	0.0554	1.61	none
43	45	M	W	26.1	3.66	0.82	0.0523	1.43	none
44	46	M	W	24.9	3.20	0.92	0.0532	1.66	slight
45	46	M	C	24.8	3.48	0.41	0.1146	3.27	slight
46	48	M	C	23.7	3.36	0.40	0.0747	2.22	slight
47	49	M	W	17.1	2.30	0.30	0.0774	3.36	none
48	49	F	W	23.7	2.90	0.46	0.1100	3.79	none
49	49	F	W	26.8	3.48	0.56	0.0592	1.70	none
		Mean....		24.4	3.29	0.57	0.0711	2.20	
50	50	M	W	26.9	3.36	0.82	0.0578	1.72	slight
51	50	M	C	24.6	2.95	0.47	0.0725	2.46	slight
52	50	F	W	26.2	3.38	0.35	0.0739	2.18	none
53	50	F	C	23.7	2.66	0.61	0.0910	3.42	moderate
54	51	M	W	26.7	3.29	0.39	0.0388	1.18	slight
55	51	M	W	27.6	3.32	1.39	0.0659	1.98	slight
56	51	M	C	26.4	3.25	0.56	0.0774	2.38	slight
57	52	M	W	22.5	2.78	0.67	0.0930	3.34	none
58	52	M	W	23.5	3.57	0.66	0.0596	1.67	none
59	53	M	W	27.2	3.85	1.22	0.0439	1.14	none
60	53	M	W	24.2	3.37	0.59	0.1305	3.87	slight
61	53	M	W	24.9	3.54	0.64	0.0477	1.35	slight
62	53	F	W	24.9	3.20	0.79	0.0316	0.99	none
64	53	F	C	23.9	3.37	0.83	0.0605	1.80	moderate
65	53	F	C	23.9	3.20	0.57	0.0552	1.68	slight
66	54	M	W	23.7	3.04	0.77	0.0438	1.44	none
67	54	M	W	25.5	3.78	1.07	0.0821	2.17	slight
68	55	M	W	26.0	3.56	0.78	0.0362	1.02	none
69	55	M	W	25.2	3.07	0.81	0.0462	1.50	none
70	55	M	W	26.0	3.43	0.90	0.0559	1.63	none
71	55	M	W	24.8	3.50	0.93	0.0610	1.75	slight
72	55	M	W	25.8	3.55	0.72	0.0512	1.44	slight
73	55	M	C	26.4	3.66	0.53	0.0664	1.81	none
74	57	M	W	26.9	3.66	0.62	0.0689	1.68	moderate
75	57	M	W	23.6	3.07	0.39	0.1100	3.57	slight
76	57	M	C	26.4	3.40	1.10	0.0610	1.79	slight
77	58	M	W	24.3	3.41	0.92	0.0402	1.18	none
78	58	M	W	25.3	3.30	0.67	0.0727	2.21	slight
79	58	M	C	24.9	3.26	0.91	0.0668	2.05	slight
80	58	M	C	25.9	3.55	0.71	0.0855	2.41	none
81	59	M	C	24.1	3.30	0.77	0.0634	1.92	slight
82	59	F	W	23.2	3.23	0.42	0.0824	2.55	none
		Mean....		25.2	3.34	0.74	0.0654	1.98	
83	61	M	W	26.4	3.48	0.65	0.0766	2.20	slight
85	61	F	W	24.0	2.93	1.01	0.0816	2.79	slight
86	62	F	W	22.4	3.29	1.75	0.0630	1.92	none
87	63	M	W	23.9	3.20	1.27	0.0798	2.49	slight
88	65	M	W	23.6	3.31	1.43	0.0989	2.98	slight
89	65	M	C	25.8	3.80	1.36	0.0711	1.87	moderate
90	66	M	W	26.4	4.11	0.85	0.0532	1.30	slight
91	68	M	W	23.0	2.99	0.86	0.0871	2.91	slight
93	69	M	W	24.6	3.15	0.63	0.1091	3.47	moderate
94	69	M	W	24.5	2.98	0.53	0.0642	2.16	slight
		Mean....		24.5	3.32	1.03	0.0785	2.41	
95	71	M	W	23.2	2.86		0.0918	3.21	slight
96	73	F	W	22.5	3.03	1.05	0.0702	2.32	slight
97	76	M	W	23.2	2.92	0.65	0.0604	2.07	slight
98	76	M	W	21.8	2.78	0.98	0.0695	2.50	slight
99	76	F	W	23.7	3.22	0.59	0.0697	2.17	slight
100	77	F	W	23.8	3.16	0.84	0.0848	2.68	none
		Mean....		23.1	3.00	0.82	0.0744	2.50	
		Grand Mean..		24.8	3.29	0.68	0.0695	2.15	

parently normal and arteriosclerotic areas of the same blood vessel. The average enzyme activity observed for the arteriosclerotic portions was 29 per cent of the value found for the apparently normal sections of the vessels (range 6 to 49 per cent).

Pulmonary artery samples.—The results of the individual aldolase determinations on the 84 pulmonary artery samples are listed in table 3. The average quantity of HDP split by the samples was 0.0695 mM (23.4 mg.) /Gm. wet tissue/hour. The mean aldolase activity of the samples derived from the women was 103 per cent of that found for the men in the corresponding age groups. If only the pulmonary artery samples from the white subjects are considered an average percentage value for the women of 109 is found.

A comparison was made of the aldolase values observed for the aortic and pulmonary artery samples derived from the same individuals. A statistical evaluation showed the values for the pulmonary artery tissue to be significantly higher than for the aortic tissue. The t value of the difference between the means was 3.59 (df 83, $p < 0.001$) when the aldolase values based on wet tissue weight were considered, and 3.73 (df 79, $p < 0.001$) when the activity values calculated on the basis of tissue nitrogen content were used in the computation.

The mean aldolase values for the various decades have been listed in table 2. The values show the same tendency to variation with age as observed for the aortic samples, but to a lower degree. Thus in contrast to the observations on the aortic samples the coefficient of correlation Age/aldolase activity was not found to be statistically significant for the pulmonary artery samples from the 10-69 year subjects:

Age / quantity of HDP split / Gm. wet tissue:
$r = +0.08$ ($t = 0.67$, $N = 72$)
Age / quantity of HDP split / Gm. tissue N:
$r = +0.15$ ($t = 1.27$, $N = 70$)

Coronary artery samples.—The results of aldolase measurements performed on 12 samples of the coronary artery from children and young adults are shown in table 4. For comparison the enzyme activities observed for the aortic samples from the same subjects have also been listed in the table. The average aldolase value found for the coronary artery system of this group of subjects was 0.0756 mM (25.4 mg.) HDP split/Gm. wet tissue/hour, as compared with 0.0618 mM (20.7 mg.) HDP split/Gm. wet tissue/hour for the aortic samples from the same individuals (t value of difference between means: 2.06; $0.05 < p < 0.10$; df 11).

TABLE 4. ALDOLASE ACTIVITY OF 12 SAMPLES OF HUMAN CORONARY ARTERY FROM CHILDREN AND YOUNG ADULTS.

No.	Age (Years)	Sex	Race	mM HDP Split /Gm. Wet Tissue /Hour	
				Coronary Artery	Aorta
6	3	M	W	0.0476	0.0407
7	3	M	W	0.0413	0.0593
8	5	M	W	0.0373	0.0582
10	6	M	W	0.0500	0.0368
11	8	F	W	0.0810	0.0866
12	10	F	C	0.0500	0.0516
19	25	M	C	0.0932	0.0710
20	25	F	W	0.1010	0.0812
22	29	M	W	0.0952	0.0680
23	30	M	C	0.0815	0.0612
25	33	M	C	0.1152	0.0688
30	38	F	C	0.1125	0.0574
Mean				0.0756	0.0618

DISCUSSION

The stability of aldolase and its independence of cofactors insure a high degree of reliability in the tissue enzyme measurements. As pointed out by Lowry and associates (6) it is reasonable to assume that the aldolase values determined for a tissue may serve as a measure of the rate of glucose metabolism.

The present investigation has established the presence of a notable aldolase activity in the tissue of the human aorta, pulmonary artery, and coronary artery system. The average aldolase values found for the arterial tissue are 250 to 300 times higher than the aldolase activity values of human serum reported by Sibley and Lehninger (7) and by Bruns (1), 1½ to 2 times higher than the values observed for human red blood cells (2), and about 1 per cent of the activity found in normal human skeletal muscle tissue (3). A comparison of the aldolase activity of human arterial tissue with the concentration of the enzyme in other human organs is rendered difficult by the general lack of information concerning the concentration of the enzyme in human tissues. The aldolase activity of human arterial tissue found in the present investigation is approximately 10 per cent of the aldolase values reported for rabbit brain by Lowry and associates (6).

The aldolase determinations performed on aortic samples from young, middle-aged, and old individuals revealed a significant increase in the concentration of the enzyme with age for samples derived from 10-69 year old subjects. Since the arteriosclerotic areas of the vessel wall showed an aldolase activity which was markedly lower than that of apparently normal portions of the artery it must be assumed that the higher aldolase values observed for the samples from the older persons indicate an increase in the aldolase activity of the unaltered parts of the arterial wall.

SUMMARY

Determinations were made of the adolase activity of 101 samples of the human thoracic aorta and 84 samples of the pulmonary artery. The age of the individuals from whom the samples were obtained ranged between 3 weeks and 80 years. The analyses were performed by a modification of the procedures described by Lowry and associates, and Sibley and Lehninger.

The average quantity of HDP split by the aortic samples was 0.0628 mM (21.0 mg.) /Gm. wet tissue/hour, and by the pulmonary artery samples 0.0659 mM (23.4 mg.) /Gm. wet tissue/hour. These values are approximately 1 per cent of the aldolase concentration reported for normal human skeletal muscle tissue.

The aldolase values of aortic samples derived from 10-69 year old persons showed a tendency to increase with the age of the subjects from whom the samples were obtained ($r = +0.29$, $t = 2.72$, $N = 83$, based on wet tissue weight; $r = +0.36$, $t = 3.48$, $N = 83$, based on tissue nitrogen content). A similar but not statistically significant increase in aldolase activity with age was observed for the pulmonary artery samples.

The aldolase values of arteriosclerotic portions of the aorta averaged 29 per cent of the values found in macroscopically normal sections of the vessel wall.

The mean aldolase activity of 12 samples of the coronary artery, derived from subjects aged 3 to 38 years, was 123 per cent of that of the aorta from the same individuals.

REFERENCES

1. Bruns, F.: Bestimmung und Eigenschaften der Serumaldolase. *Biochem. Ztschr., 325:* 156-162, 1954.
2. Bruns, F.: Über die Aldolase der Erythrocyten. *Biochem. Ztschr., 325:* 429-438, 1954.
3. Dreyfus, J., Schapira, G., and Schapira, F.: Biochemical Study of Muscle in Progressive Muscular Dystrophy. *J. Clin. Invest., 33:* 794-797, 1954.
4. Knobil, E., Hagney, M. G., Wilder, E. J., and Briggs, F. N.: Simplified Method for Determination of Total Adrenal Cholesterol. *Proc. Soc. Exp. Biol. & Med., 87:* 48-50, 1954.
5. Lowry, O. H., Roberts, N. R., Wu, M., Hixon, W. S., and Crawford, E. J.: The Quantitative Histochemistry of Brain. II. Enzyme Measurements. *J. Biol. Chem., 207:* 19-37, 1954.
6. Lowry, O. H., Roberts, N. R., Leiner, K. Y., Wu, M.; Farr, A. L., and Albers, R. W.: The Quantitative Histochemistry of Brain. III. Ammon's Horn. *J. Biol. Chem., 207:* 39-49, 1954.
7. Sibley, J. A., and Lehninger, A. L.: Aldolase in the Serum of Tumor-Bearing Animals. *J. Nat. Cancer Inst., 9:* 303-309, 1948.
8. Sibley, J. A., and Lehninger, A. L.: Determination of Aldolase in Animal Tissues. *J. Biol. Chem., 177:* 859-872, 1949.

PULMONARY FUNCTION STUDIES: AGE DIFFERENCES IN LUNG VOLUMES AND BELLOWS FUNCTION

ARTHUR H. NORRIS, B.A., NATHAN W. SHOCK, Ph.D., MILTON LANDOWNE, M.D., AND JOSEPH A. FALZONE, JR., M.D.

(From the Gerontology Branch, National Heart Institute, National Institutes of Health, P.H.S., D.H.E.&W., Bethesda, Maryland, and the Baltimore City Hospitals, Baltimore)

Evaluation of the ventilatory responses to exercise of older people has raised questions about the adequacy of bellows function with increasing age (21). At low and medium levels of work groups of older subjects always showed greater ventilatory response than any younger group. However, at the highest level of work they were able to perform, the 80 year old subjects showed less ventilatory response than the 65 year old group as well as a significantly reduced maximal oxygen uptake.

The literature has not provided any age studies of lung volumes and bellows function with which one might compare the results mentioned above. The available age studies are either limited in age range or have very small samples of subjects over 60 years old. Whitfield, Waterhouse, and Arnott (27) have compiled a list of lung volumes of normal subjects. This list dates from Bohr (7, 1907) to Birath (6, 1944) and includes 255 males and 108 females from 18 to 63 years of age. Greifenstein and associates (14) have tabulated by author about 80 subjects 47 years or older who have had various measures of pulmonary function. Table 1 summarizes all of the sources of data mentioned by Greifenstein and associates and includes some subsequent studies on young and old subjects.

In the present study, we have evaluated the lung compartments and bellows function of a selected group of male subjects evenly distributed over a broad age range and uniformly exposed to a standard test situation.

METHODS

The terminology and definitions in these methods conform to the American respiratory physiologists' agreement of 1950 (22).

Functional Residual Capacity.—The functional residual capacity (FRC) was measured by having the subject inspire a mixture of 80 per cent helium and 20 per cent oxygen for 18 minutes and then washing the helium from the lungs with atmospheric air for 10 minutes. The volume of helium washed from the lungs represents a portion of the ventilated space plus any dissolved helium returned by the blood. If the helium is uniformly mixed in the ventilated space,

$$V = \frac{V_{He}}{F E_{He}} \times 100 - \text{He returned},$$

where: V = ventilated volume (FRC) of the subject

V_{He} = volume of helium washed from the lungs

$F E_{He}$ = the concentration of helium in the expired air at the beginning of the washout.

In practice no correction was made for the helium returned by the blood.

Expired air was collected in a 120 L. Tissot spirometer through low resistance Bailey valves. A 600 L. supply spirometer was used to hold the inspired He-O_2 mixture. An additional valve for selecting the helium mixture or atmos-

TABLE 1. AGE STUDIES (NORMAL) OF LUNG VOLUMES AND MAXIMUM BREATHING CAPACITY.*

Ref.	Author	Year	Number of Subjects		Age Range	Posture
			Male	Female		
17.	Hurtado and Boller...	1933	50	..	18-30	Lying
18.	Kaltreider et al.....	1938	50	..	38-63	Lying
23.	Robinson†.....	1938	94	..	6-91	Lying
1.	Aslett et al.	1939	66	..	19-63	Sitting
3.	Baldwin et al.‡	1948	50	39	16-79	Lying
4.	Bates and Christie§ ..	1950	27	..	17-62	Not stated
14a.	Gilson (from Greifenstein et al.)	1950	10	..	52-55	Not stated
27.	Whitfield et al.....	1950	64	32	11-69	Sitting Lying
14.	Greifenstein et al....	1952	11	14	50-77	Lying
2.	Astrand †.....	1952	45	51	20-25	Standing
24.	Sartorelli et al. ‖	1955	21	..	69-84	Lying
XX.	Present Study.....	1956	135	..	24-87	Lying

* Maximal breathing capacity given only in Ref. 3 and XX.
† No data for total lung capacity.
‡ Gives only vital capacity.
§ Gives only functional residual capacity.
‖ No data on functional residual capacity.

Submitted for publication July 19, 1956.

We are indebted to Charles K. Ferguson and B. D. Smith for help in initiating the experimental program and to John B. Melvin for assistance in performing the determinations. We wish to thank Dr. Max Halperin for advice in statistical matters and Mrs. Elizabeth Benser for performing statistical calculations. We are most grateful to Drs. John H. Miller, Harold Silver, Morton D. Bogdonoff, Felix A. Silverstone, Donald M. Watkin, and Martin Brandfonbrener, who provided the clinical descriptions.

pheric air for inspiration was attached to the face mask. The volume of helium collected in the spirometer was corrected for the dead space of the expired circuit to calculate the helium washed from the subject. The error (standard deviation) of determination of the 0.9 L. dead space was 0.02 L., while the errors (standard deviation) of determination of the volumes of a rigid container (2.023 L.) and a semi-rigid container (1.800 L.) were 0.03 L. Helium gas analyses were performed with a recording katharometer with an accuracy of 0.07 per cent He.

This method falls into the general classification of open circuit methods for determination of functional residual capacity suggested by Darling and associates (10). The first use of helium in this type of determination was made by Behnke, Feen, and Welham (5) and Welham and Behnke (28). Similar methods have been described (16, 20) more recently.

Vital Capacity and Subdivisions.—The vital capacity (VC) was determined with subjects both standing and recumbent by having them inspire maximally and then expire maximally into a recording Tissot spirometer. Complete spirograms were recorded for recumbent subjects with a closed circuit apparatus. A mouthpiece and nose clip were used for these collections. Three trials were made for each effort (inspiratory reserve volume (IRV), expiratory reserve volume (ERV), and vital capacity (VC), standing and recumbent). The largest value was recorded as the value for the day. The resting tidal volume was determined by dividing the total volume of the 10-minute washout collection period by the number of breaths during this period counted from a kymograph tracing.

Maximal Breathing Capacity.—The maximal breathing capacity (MBC) was determined in standing subjects who were asked to breathe as much air as possible into a spirometer through a low resistance circuit for 15 sec. The breathing rate and depth were not specified, but the subject was urged to do his best throughout the test. The highest volume attained in 3 trials was taken as the value for the day. This type of procedure was reported first by Hermannsen (15) and has been modified and standardized by other investigators (9,13).

Total Lung Capacity and Residual Volume.—The total lung capacity (TLC) was determined by adding the functional residual capacity and the inspiratory capacity (IC). The residual volume (RV) was determined by subtracting the vital capacity from the total lung capacity.

Anthropometric Measurements. — Measurements were made of weight and height for the purpose of describing possible changes in body size. Surface area was calculated from weight and height by the formula of DuBois and DuBois (12).

Blood Acid-Base Balance. — The acid-base balance of samples of finger blood was evaluated according to the method of Shock and Hastings (25) except that the pH was read with a temperature controlled glass electrode (11) instead of colorimetrically.

TABLE 2. COMPARISON OF DAILY ESTIMATES OF LUNG VOLUMES AND MAXIMAL BREATHING CAPACITY IN TWO EXPERIMENTAL SUBJECTS. PAIRS OF EXPERIMENTAL DAYS ARE SEPARATED BY ONE YEAR OR MORE.

Subject	Age	Date	FRC (L.)	TV (L.)	VC (L.)	SVC (L.)	IRV (L.)	ERV (L.)	IC (L.)	TLC (L.)	RV (L.)	MBC (L./min.)
No. 5	45	12-20-51	2.34	.69	5.25	5.61	3.74	.88	4.38	6.71	1.46	118.37
	45	1-10-52	2.30	.53	5.42	5.68	3.82	1.62	4.40	6.60	1.27	120.87
	46	2- 6-53	2.84	.58	4.93	5.51	3.43	1.07	3.86	6.70	1.77	119.38
	46	2-10-53	2.78	.58	4.91	5.64	3.39	1.03	3.89	6.66	1.75	121.92
	47	3-23-54	2.17	.72	5.14	5.35	3.58	1.14	3.99	6.17	1.03	119.81
	47	3-24-54	2.41	.74	5.03	5.41	3.61	1.01	4.02	6.43	1.40	110.74
	49	5-28-56	2.16	.80	4.86	5.31	3.53	.82	4.04	6.19	1.33	108.07
	49	5-29-56	2.39	.77	4.86	5.43	3.75	.75	4.11	6.50	1.64	113.76
No. 1	27	12-10-51	2.22	.88	4.54	5.53	2.91	.91	3.63	5.85	1.32	131.94
	27	12-28-51	2.43	.66	5.71	6.00	3.86	1.29	4.51	6.93	1.22	142.74
	28	1- 8-53	2.92	.83	5.30	5.88	3.48	1.13	4.18	7.09	1.79	152.54
	28	2-12-53	2.98	.64	5.36	6.08	3.41	1.20	4.05	7.02	1.66	137.85
	29	3- 9-54	3.01	.73	5.17	5.92	3.31	1.25	3.92	6.93	1.76	122.30
	29	3-16-54	2.84	.64	5.63	5.92	3.69	1.19	4.43	7.28	1.65	124.60
	31	2-24-56	2.21	.67	5.11	5.55	3.48	.89	4.21	6.42	1.32	156.38
	31	5-28-56	2.04	.87	5.16	5.72	3.68	.87	4.29	6.34	1.18	160.18

SUBJECTS

Selection.—Subjects were 135 male patients selected from the Baltimore City Hospitals Infirmary Division (Old People's Home), as well as staff members and employees of the hospitals. They were evenly distributed from the third through the ninth age decades. All were adjudged free of acute and severe chronic pulmonary pathology on the basis of specific, uniformly applied selection criteria. Subjects were selected within 3 days prior to the test and rechecked on the day of the test.

Preparation.—Subjects received no sedation for 12 hours prior to the test. A fat free, low protein breakfast or lunch (without tea or coffee) was served to the subject at least 2 hours before the test began.

Clinical Description.—The physicians of the staff were asked to evaluate the clinical status of these subjects to provide some individual clinical characterization of the material studied. A form oriented toward the pulmonary system was provided to aid the examiner in the completeness of his review. None of the test results of the study were used by the clinician. In addition to his clinical diagnosis, the examiner was asked to make a clinical estimate of the degree of impairment in ventilatory and in total pulmonary function wherever this was possible. Ratings of ventilatory functional impairment on the basis of none (*0*), slight (*1*), moderate (2), and marked (3) were provided in this manner for 91 subjects.

EXPERIMENTAL DESIGN

Measurements of lung volumes, maximal breathing capacity, and anthropometric size were made on each of two days for acceptable resting subjects.

Estimates of the acid-base balance of the blood were made within two weeks of one of the experimental days.

RESULTS

Variability of Measurement.—Table 2 gives the results of lung volume and maximal breathing capacity measurements for 2 subjects who had paired estimates at yearly intervals while the present data were being collected. Inspection of the table fails to show trends in any of the measures.

Table 3 shows the mean values and standard deviations of distributions (26) of lung volumes and anthropometric measurements for each age decade included in this study. There is no systematic increase in the standard deviation of

TABLE 3. MEAN VALUES AND STANDARD DEVIATIONS OF THE DISTRIBUTION OF LUNG VOLUMES, MAXIMUM BREATHING CAPACITY AND ANTHROPOMETRIC MEASUREMENTS BY AGE DECADES.

Measure	Units	Age (Years)													
		20–29 N = 18		30–39 N = 18		40–49 N = 18		50–59 N = 21		60–69 N = 20		70–79 N = 20		80–89 N = 20	
		Mean	σd	Mean	σd	Mean	σd	Mean	σd	Mean	σd	Mean	σd	Mean	σd
Lung Volumes:															
Functional Residual Capacity	L.	2.28	.50	2.39	.69	2.56	.46	2.97	.81	2.48	.53	2.84	.71	2.76	.85
Tidal Volume	L.	.57	.11	.57	.14	.57	.17	.59	.13	.52	.11	.52	.12	.49	.13
Vital Capacity	L.	4.49	.88	4.20	.99	3.50	.82	3.30	.68	2.80	.80	2.37	.49	2.36	.79
Vital Capacity (Standing)	L.	4.84	.94	4.49	.97	3.84	.88	3.56	.75	3.04	.78	2.56	.55	2.54	.81
Inspiratory Reserve Volume	L.	3.12	.79	2.92	.89	2.18	.66	2.09	.69	1.82	.67	1.52	.38	1.38	.52
Expiratory Reserve Volume	L.	.95	.22	.89	.38	.85	.31	.66	.25	.50	.22	.39	.20	.47	.34
Inspiratory Capacity	L.	3.56	.78	3.32	.85	2.62	.72	2.64	.64	2.30	.68	1.98	.43	1.90	.53
Total Lung Capacity	L.	5.82	1.01	5.66	1.22	5.18	.86	5.61	.75	4.76	.79	4.81	.83	4.66	1.21
Residual Volume	L.	1.33	.38	1.51	.42	1.71	.51	2.31	.73	1.95	.64	2.44	.63	2.30	.64
Maximal Breathing Capacity	L./Min.	131.72	37.79	118.40	31.34	104.86	32.39	76.76	27.76	69.97	28.25	55.74	21.17	49.84	23.48
Anthropometric:															
Weight	Kg.	77.5	19.6	74.2	11.1	67.8	11.5	63.0	8.6	63.5	9.5	63.2	13.5	59.7	10.1
Height	Cm.	174.3	4.9	176.6	5.3	173.2	5.3	171.3	6.6	167.8	4.7	166.9	6.1	163.9	8.2
Surface Area	Sq. M.	1.92	.20	1.90	.13	1.81	.12	1.74	.13	1.72	.12	1.71	.18	1.65	.16

TABLE 4. LINEAR REGRESSIONS OF LUNG VOLUMES AND ANTHROPOMETRIC MEASURES ON AGE (N=135).

Measure	Units	Standard Error of Estimate	Estimate of Measure at Age 55 Yrs.	Slope of Regression (Units /Yr.)	Probability
Lung Volumes:					
Functional Residual Capacity	L.	.35	2.62	.0079	.005
Tidal Volume	L.	.10	.54	−.0014	.008
Vital Capacity	L.	.38	3.26	−.0401	<.001
Vital Capacity Standing	L.	.38	3.52	−.0427	<.001
Inspiratory Reserve Volume	L.	.34	2.12	−.0315	<.001
Expiratory Reserve Volume	L.	.19	.66	−.0102	<.001
Inspiratory Capacity	L.	.34	2.60	−.0299	<.001
Total Lung Capacity	L.	.55	5.20	−.0217	<.001
Residual Volume	L.	.38	1.96	.0180	<.001
Maximal Breathing Capacity	L./Min.	14.92	85.28	−1.493	<.001
Anthropometric:					
Weight	Kg.	1.34	66.7	−.2951	<.001
Height	Cm.	1.06	170.4	−.2081	<.001
Surface Area	Sq. M.	.02	1.77	−.0046	<.001

the distribution of any of the measurements with age.

The standard error of estimates of day 2 from day 1 (26) is presented in the second column of table 4 for each variable. This statistic includes within-individual variability and measurement error as well as variability caused by sampling on different days.

Regression of Primary Measures on Age.—Figure 1 shows the scatter of individual values for residual volume, total lung capacity, vital capacity, and maximal breathing capacity plotted against age. Although the scatter is wide, some age regression is indicated and simple linear regression statistics have been applied.

Table 4 also shows values for linear regression (26) of lung volumes and anthropometric measures on age and the probability of their chance occurrence. Of the lung volumes, only functional residual capacity and tidal volume (TV) fail to meet our criteria for significance of regression $P = < .001$). All other lung volumes decrease, except residual volume, which increases. Maximal breathing capacity diminishes significantly with age. Measures of body size showed significant decrease with age.

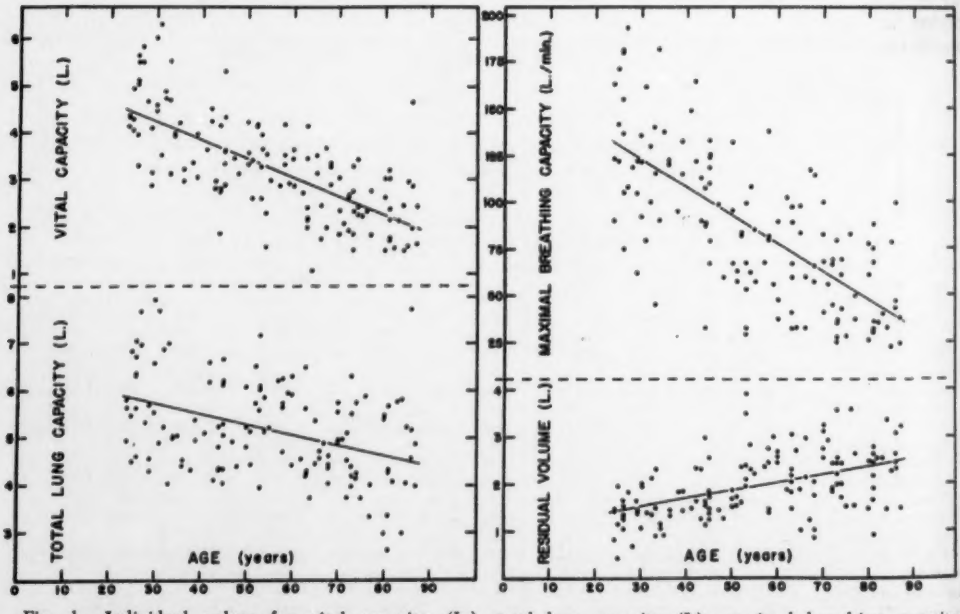


Fig. 1. Individual values for vital capacity (L.), total lung capacity (L), maximal breathing capacity (L./min.), and residual volume (L.) are plotted against age for 135 subjects. Lines of calculated linear regression are superimposed.

Residual Volume/Total Lung Capacity Ratio.—The increase with age of the residual volume/total lung capacity ratio of 0.5 per cent per year was significant with $P = < .001$. The estimate of the ratio at age 55 years was 38.4 per cent.

Effect of Correcting Lung Volumes for Body Size. Table 5 shows the regression on age of lung volumes and maximal breathing capacity after each was divided by the surface area of the individual subject. The decrease in total lung capacity is no longer significant and tidal volume shows no average change whatever. Functional residual capacity now shows a significant increase.

Maximal Breathing Capacity.—The average values for tidal volume, total 15-second volume, and number of breaths required for each of 6 trials by each individual in a sub-sample of 107 subjects are summarized by age decades in figure 2. With increasing age the marked reduction in volume is roughly paralleled by a reduction in breathing rate, so that tidal volume is not greatly altered. Figure 3 shows the 15-second volumes plotted against the number of breaths required for each of 6 trials by the 20 year old subjects and 80 year old subjects in the sub-sample. An individual's highest value is circled but his other trials are not coded. The pluses indicate the averaged data from 8 "nor-

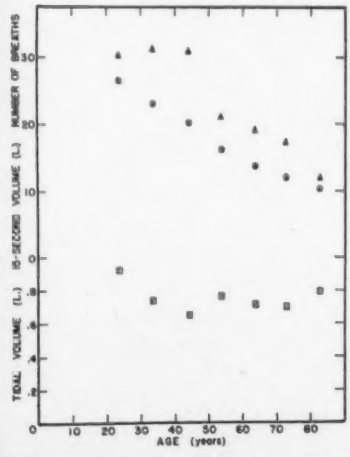


Fig. 2. Average values for tidal volume, ⊡, total 15-second volume, ⊙, and number of breaths, △, required for each of 6 trials by each individual in a sub-sample of 107 subjects are averaged and plotted by age decades. Total 15-second volume and number of breaths are plotted on the same scale.

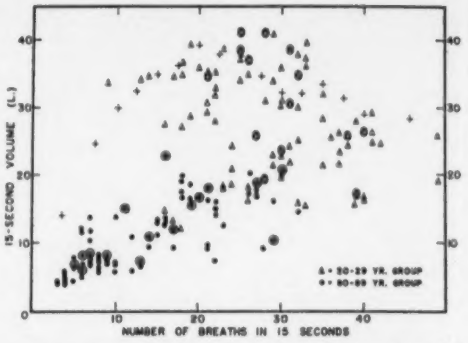


Fig. 3. Fifteen-second volumes are plotted against the number of breaths required for each of 6 MBC trials by 20 year old subjects, △, and 80 year old subjects, ●. An individual's highest value is circled but his other trials are not coded. The pluses, +, indicate the averaged data from 8 subjects of Cara and Economides.

TABLE 5. LINEAR REGRESSION OF SIZE-CORRECTED LUNG VOLUMES ON AGE (N=135).

Measure	Units	Estimate of Measure at Age 55 Yrs.	Slope of Regression (Units /Yr.)	Probability
Functional Residual Capacity	L./m.²	1.50	.0083	<.001
Tidal Volume	L./m.²	.31	.0000	——
Vital Capacity	L./m.²	1.82	−.0175	<.001
Vital Capacity (Standing)	L./m.²	1.97	−.0187	<.001
Inspiratory Reserve Volume	L./m.²	1.18	−.0143	<.001
Expiratory Reserve Volume	L./m.²	0.37	−.0047	<.001
Inspiratory Capacity	L./m.²	1.45	−.0128	<.001
Total Lung Capacity	L./m.²	2.94	−.0044	.037
Residual Volume	L./m.²	1.12	.0130	<.001
Maximal Breathing Capacity	L./m.² /min.	47.39	−.721	<.001

TABLE 6. DISTRIBUTION OF SUBJECTS ACCORDING TO CLINICAL ESTIMATION OF VENTILATORY FUNCTION.

Age Group	Impairment—Rating				Total Subjects Examined
	None (0)	Slight (1)	Moderate (2)	Marked (3)	
20–29	12	—	—	—	12
30–39	11	—	—	—	11
40–49	10	2	—	—	12
50–59	10	2	2	—	14
60–69	13	2	—	—	15
70–79	4	4	2	1	11
80–89	6	4	4	2	16
Totals	66	14	8	3	91

mal" (presumably young) subjects of Cara and Economides (8).

Clinical Evaluation.—The results of clinical evaluation of the ventilatory function in 91 subjects are summarized in table 6. Without benefit of the laboratory measures under study and without special training or direction in pulmonary functional evaluation other than a reminder form, the examiners provided clinical evaluations which disclosed a trend toward impairment of ventilatory function with age quite similar to that found by laboratory tests. Functional impairment was judged to be clinically detectable in 6 of 49 subjects under 60 years of age and in 19 of 42 subjects who were 60 years of age or over.

Table 7 presents a comparison of the mean lung volumes corrected for body size for subjects grouped according to the clinical estimates of pulmonary function and age. Since the class 2 and 3 subjects tended to be among the oldest and smallest in the age groups, this type of comparison tends to remove both age and size bias. Removing the 25 subjects in whom any reduction in ventilatory function was suspected by the examiner reduces to some extent the age regressions for VC and MBC, although these remain statistically significant. The age regression of TLC is also reduced, but this volume, corrected for body size, shows no significant age regression for the total group. The regression coefficient of RV is not reduced. Age accounts for approximately 25 per cent of the total variance in either analysis and leaves the greatest part of total variance attributable to individual differences. For the 66 subjects in whom the examiner found nothing to indicate that there was impairment in pulmonary ventilatory function, the only difference from the total group was the disappearance of significant age regression of total lung capacity leaving a significant agewise reduction in vital capacity and its subdivisions and significant agewise increase in residual volume.

No age differences in blood CO_2 content, pH, carbonic acid, CO_2 tension, and serum bicarbonate could be shown in the sub-sample of 107 subjects.

DISCUSSION

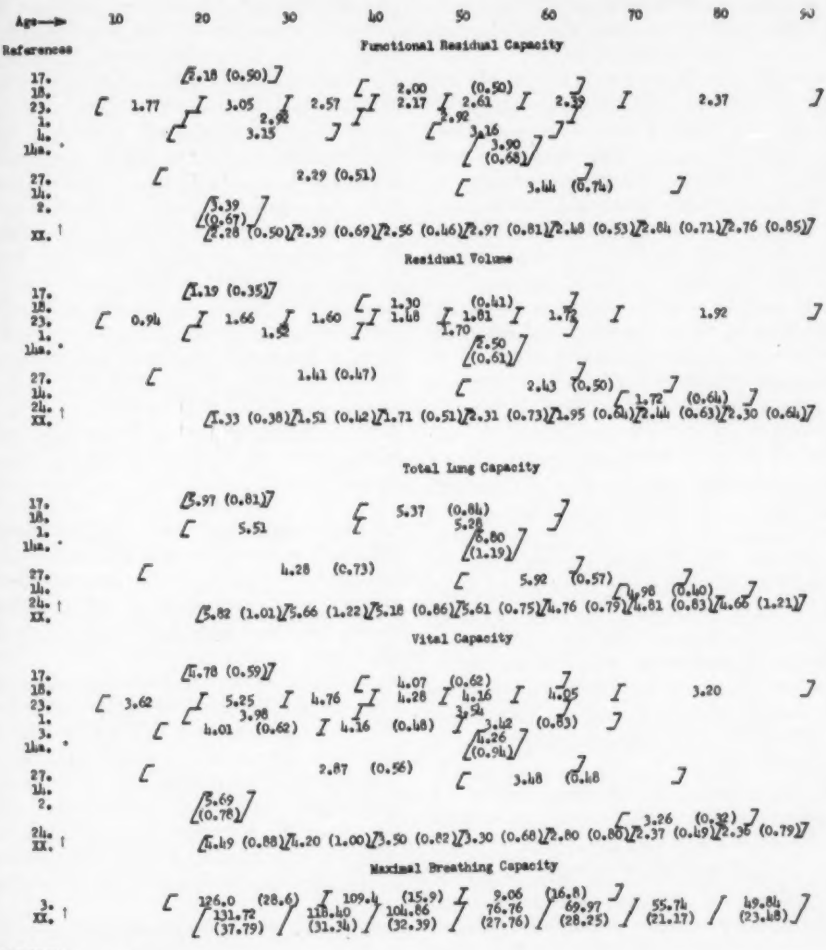
Our average values and standard deviations from table 3 are compared with other values from the literature in table 8. The values from the present study tend to fall near the center of the distributions of the others shown. Estimates of variability are comparable to those of the other studies shown except in the case of maximal breathing capacity. These comparisons are adequate to establish the comparability of

TABLE 7. COMPARISON OF AVERAGE VALUES BY AGE DECADES OF SIZE-CORRECTED LUNG VOLUMES ($L.m^2$) FOR ALL SUBJECTS AND TWO CLINICAL GROUPS (*0+1* RATING AND *2+3* RATING).

Age (Yrs.)	Functional Residual Capacity			Tidal Volume			Vital Capacity			Vital Capacity Standing			Inspiratory Reserve Volume		
	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*
20–29	1.19	1.14	—	.30	.30	—	2.36	2.27	—	2.54	2.44	—	1.64	1.60	—
30–39	1.26	1.34	—	.30	.30	—	2.19	2.16	—	2.35	2.31	—	1.51	1.48	—
40–49	1.43	1.50	—	.31	.29	—	1.94	1.93	—	2.14	2.09	—	1.21	1.18	—
50–59	1.73	1.82	1.88	.34	.34	.38	1.89	1.90	1.50	2.04	2.08	1.70	1.18	1.15	.80
60–69	1.46	1.54	—	.30	.31	—	1.62	1.65	—	1.76	1.80	—	1.05	1.04	—
70–79	1.67	1.63	1.66	.31	.31	.23	1.40	1.50	1.28	1.51	1.58	1.24	.90	.97	.86
80–89	1.68	1.67	1.94	.30	.31	.29	1.43	1.59	1.19	1.54	1.67	1.37	.83	.91	.65

Age (Yrs.)	Expiratory Reserve Volume			Inspiratory Capacity			Total Lung Capacity			Residual Volume			Maximal Breathing Capacity		
	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*	All	*0+1*	*2+3*
20–29	.50	.47	—	1.87	1.80	—	3.06	2.95	—	.70	.68	—	69.52	69.79	—
30–39	.47	.48	—	1.73	1.68	—	2.96	2.97	—	.79	.86	—	62.33	58.45	—
40–49	.47	.50	—	1.45	1.43	—	2.88	2.93	—	.95	1.00	—	58.28	59.21	—
50–59	.38	.42	.30	1.51	1.47	1.20	3.24	3.29	3.06	1.34	1.39	1.56	43.74	41.76	32.34
60–69	.29	.30	—	1.34	1.35	—	2.78	2.86	—	1.15	1.22	—	40.41	41.60	—
70–79	.24	.25	.15	1.17	1.25	1.13	2.83	2.86	2.79	1.44	1.37	1.52	32.57	34.60	39.91
80–89	.28	.34	.22	1.15	1.25	.97	2.82	2.92	2.90	1.39	1.33	1.72	29.85	35.25	20.16

TABLE 8. COMPARISON OF MEAN VALUES AND STANDARD DEVIATIONS OF DISTRIBUTIONS (IN PARENTHESES) OF LUNG VOLUMES AND M.B.C.



* Gilson (from Greifenstein et al.)
† Present study.

our data with previous results, but are not very useful in comparing age changes. We can say that in those measurements where striking age changes occur (vital capacity, maximal breathing capacity) they are similar in direction and magnitude for present and previous data.

The removal of the significant age decrement in total lung capacity by surface area correction indicates that people of different ages have total lung capacities commensurate with body size. Because our older subjects were smaller, residual volume per square meter surface area is then a statement, without age bias, of the fixed lung space, as vital capacity per square meter surface area is a statement, without age bias, of the mobile lung space. While the highly useful, residual volume/total lung capacity ratio has the advantage of being without individual or age bias it has the disadvantage of being dimensionless. We might instead consider the relationship of fixed space to mobile space, that is, residual volume to vital capacity. It seems de-

sirable to deal with statements of the fixed-mobile space relationships which convey an idea of quantity. Thus, 0.95 L./m² and 2.01 L./m² would represent quantitatively the fixed space-mobile space relative to body size and permit deductions as to their relationship.

We have seen in figure 2 that the ventilatory minute volume in the MBC test is reduced with age and that the primary cause is the relatively reduced breathing rate. This breathing rate reduction could be due, among other things, to increased chest rigidity in the older subjects so that breathing rate is sacrificed to maintain tidal volume. Since we have no measures of rigidity for this group, we cannot evaluate this factor. It is also possible that this breathing rate reduction is similar to other reductions of speed of movement and response that have been demonstrated for older subjects in situations where the affector muscles were minimally loaded, that is, where the counterpart of increased rigidity could not be demonstrated.

Both for our data and the data of Cara and Economides (fig. 3) there seems to be an optimum breathing rate for the young subjects between 80 and 120 breaths per minute. At higher and lower breathing rates a reduction in MBC score is indicated. The oldest subjects on the other hand seem able only to improve their score by increasing rate. While higher maximum values might be obtained by specifying the breathing rate during the test, many of the oldest subjects might not attain rates of 80-100 breaths/min.

Thus, the reduction in breathing rate in the older subjects results in a different performance of the MBC in old and young subjects.

The volitional aspects of the MBC test cannot be ignored. It is quite possible that the poor performances seen at any age level could result from lack of motivation. On the other hand poor performances even among the young subjects probably reflect individual limitations since not all best performances are grouped at a high volume level.

The inclusion of subjects judged to have clinical signs of moderate or marked ventilatory impairment reduced average vital capacity and maximal breathing capacity and increased the average residual volume in the oldest subjects (table 7). While on the average less than 30 per cent of the subjects examined were considered to show some clinical evidence of impairment in ventilatory function, this varied from 0 in the two youngest decades to over 60 per cent in the oldest decade. Although some subjects with reduced ventilatory function can be identified by the clinician without recourse to laboratory measures, others are not clinically detected, for the exclusion of grades 2 and 3 leaves a group of subjects who have significant agewise changes in lung volume. Patients with severe pulmonary disease were not included since this was a study of the ostensible "normal," but it cannot be denied that some of the observed agewise decrease in ventilatory function may be due to an accumulating incidence in the severity of pulmonary and extrapulmonary pathology. In fact, our measures may constitute indices of the degree to which such processes, among others, contribute to impairment in function. That this trend would nevertheless be expected to exist in a population drawn entirely apart from the hospital environment is suggested by its persistence after removal of the subjects classified as grades 2 and 3.

SUMMARY

Lung compartments and bellows function of 135 male subjects, evenly distributed between the ages of 20 and 90 years and selected by specific criteria designed to exclude acute and severe chronic pulmonary pathology, showed significant increase in the fixed lung space (residual volume) at the expense of mobile lung space (vital capacity) with increasing age. The average reduction of 17.5 cc. per square meter per year in vital capacity and increase of 13.0 cc. per square meter per year in residual volume were significant. The decrease of 4.5 cc. per square meter per year in total lung capacity was not significant, indicating that at any age total lung capacity is commensurate with body size.

Reduction in maximal breathing capacity was attributed primarily to lesser augmentation of breathing rate in the older subjects.

REFERENCES

1. Aslett, E. A., D'Arcy Hart, P., and McMichael, J.: The Lung Volume and Its Subdivisions in Normal Males. *Proc. Roy. Soc., London, s.B.* No. 845, 26: 502-528, 1939.
2. Astrand, P.-O: *Experimental Studies of Physical Working Capacity in Relation to Sex and Age.* Ejnar Munksgaard, Copenhagen, 1952.
3. Baldwin, E. deF., Cournand, A., and Richards, D. W., Jr.: Pulmonary Insufficiency: I. Methods of Analysis, Physiological Classification, Standard Values in Normal Subjects. *Medicine, 27:* 243-278, 1948.

4. Bates, D. V., and Christie, R. V.: Intrapulmonary Mixing of Helium in Health and in Emphysema. *Clin. Sc., 9:* 17-27, 1950.
5. Behnke, A. R., Jr., Feen, B. G., and Welham, W. C.: The Specific Gravity of Healthy Men. Body Weight ÷ Volume as an Index of Obesity. *J. A. M. A., 118:* 495-498, 1942.
6. Birath, G.: Lung Volume and Ventilation Efficiency. *Acta med. Scandinav.,* Suppl. 154: 1-215, 1944.
7. Bohr, C.: Die funktionellen Änderungen in der Mittellage und Vitalkapazität der Lungen. Normales und pathologisches Emphysem. *Deutsches Arch. Klin. Med., 88:* 385-434, 1907.
8. Cara, M., and Economides, E.: Spectre de Fréquence de l'Air Courant et de la Ventilation lors de l'Épreuve de la Ventilation Maxima, Relation avec la Courbe d'Expiration Forcée. *Compl. rend. Soc. de biol., 146:* 709-711, 1952.
9. Cournand, A., Richards, D. W., Jr., and Darling, R. C.: Graphic Tracings of Respiration in Study of Pulmonary Disease. *Am.. Rev. Tuberc., 40:* 487-516, 1939.
10. Darling, R. C., Cournand, A., Mansfield, J. S., and Richards, D. W., Jr.: Studies on the Intrapulmonary Mixture of Gases. III. An Open Circuit Method for Measuring Residual Air. *J. Clin. Investigation, 19:* 609-618, 1940.
11. Dill, D. B., Daly, C. A., and Forbes, W. H.: pK′ of Serum and Red Cells. *J. Biol. Chem., 117:* 569-579, 1937.
12. DuBois, D., and DuBois, E. F.: A Formula to Estimate the Approximate Surface Area if Height and Weight Be Known. *Arch. Int. Med., 17:* 863-871, 1916.
13. Gray, J. S., Barnum, D. R., Matheson, H. W., and Spies, S. N.: Ventilatory Function Tests. I. Voluntary Ventilation Capacity. *J. Clin. Investigation, 29:* 677-681, 1950.
14. Greifenstein, F. E., King, R. M., Latch, S. S., and Comroe, J. H., Jr.: Pulmonary Function Studies in Healthy Men and Women 50 Years and Older. *J. Appl. Physiol., 4:* 641-648, 1952.
15. Hermannsen, J.: Untersuchungen über die maximale Ventilationsgrösse (Atemgrenzwert). *Ztschr. f.d. ges. exper. Med., 90:* 130-137, 1933.
16. Hickam, J. B., Blair, E., and Frayser, R.: An Open Circuit Helium Method for Measuring Functional Residual Capacity and Defective Intrapulmonary Gas Mixing. *J. Clin. Investigation* 33: 1277-1286, 1954.
17. Hurtado, A., and Boller, C.: Studies of Total Pulmonary Capacity and Its Subdivisions. I. Normal, Absolute and Relative Values. *J. Clin. Investigation, 12:* 793-806, 1933.
18. Kaltreider, N. L., Fray, W. W., and Hyde, H. V.: The Effect of Age on the Total Pulmonary Capacity and Its Subdivisions. *Am. Rev. Tuberc., 37:* 662-689, 1938.
19. Miles, W. R.: Psychological Aspects of Ageing. Chap. 28: in Cowdry, E. V. (ed.) *Problems of Ageing,* Williams and Wilkins, Baltimore, 2nd edition, 1942.
20. Norris, A. H., Landowne, M., and Shock, N. W.: Method for Determination of Lung Compartments and Bellows Function in Humans. (Abstract) *Federation Proc., 2:* (Pt. 1), 114, 1952.
21. Norris, A. H., Shock, N. W., and Yiengst, M. J.: Age Differences in Ventilatory and Gas Exchange Responses to Graded Exercise in Males. *J. Gerontol., 10:* 145-155, 1955.
22. Pappenheimer, J.: Standardizations of Definitions and Symbols in Respiratory Physiology. *Fed. Proc., 9:* 602-605, 1950.
23. Robinson, S.: Experimental Studies of Physical Fitness in Relation to Age. *Arbeitsphysiologie, 10:* 251-323, 1938.
24. Sartorelli, E., Ingegnieros, S., and Martelli, G.: Sulla Frequenza e Gravità dell'Enfisema Polmonare Senile. *Gior. Gerontol., 3:* 129-136, 1955.
25. Shock, N. W., and Hastings, A. B.: Studies of the Acid-Base Balance of the Blood. I. A Microtechnique for the Determination of the Acid-Base Balance of the Blood. *J. Biol. Chem., 104:* 565-573, 1934.
26. Snedecor, G. W.: *Statistical Methods,* 4th edition. Iowa State College Press, Ames, 1946..
27. Whitfield, A. G. W., Waterhouse, A. H., and Arnott, W. M.: The Total Lung Volume and Its Subdivisions. A Study in Physiological Norms. I. Basic Data. *Brit. J. Social Med., 4:* 1-25, 1950.
28. Welham, W. C., and Behnke, A. R., Jr.: The Specific Gravity of Healthy Men. Body Weight ÷ Volume and Other Physical Characteristics of Exceptional Athletes and of Naval Personnel. *J. A. M. A., 118:* 498-501, 1942.

AGE AND THE RATIO T_mPAH/T_m DIODRAST IN MAN WITH A NOTE ON THE SELF-DEPRESSION OF T_m DIODRAST

(From the Gerontology Branch, National Heart Institute, National Institutes of Health, P.H.S., D.H.E.&W., Bethesda, Maryland, and the Baltimore City Hospitals, Baltimore, Maryland)

IRWIN STOLOFF, M.D., DONALD M. WATKIN, M.D., AND NATHAN W. SHOCK, PH.D.

Although estimates of renal plasma flow have been shown to be identical when either diodrast or PAH is used as the test material (8), values for T_m are consistently higher when determined with PAH than with diodrast, even when reduced to a molar basis (2). Since both diodrast and PAH have been used to estimate age changes in T_m in our laboratory (3, 10), comparison of results from the two methods requires knowledge of whether the relationship between T_m diodrast and T_mPAH is influenced by age. The present study compares the T_m values obtained when both T_mPAH and T_m diodrast were measured in the same old and young subjects.

EXPERIMENTAL METHODS

Subjects: A total of 20 subjects were chosen from the wards of the Baltimore City Hospitals. Patients selected for study were free from recent or remote renal disease, coronary artery disease, or hypertension as determined by history, physical examination, or laboratory determinations on morning urine specimens. Some of the younger subjects were from acute wards of the Hospital but were accepted only if they were in the convalescent stages of their disease, afebrile, and had been without medication for several days. The old subjects were from the Infirmary Division (Old People's Home) where admission is for socio-economic reasons rather than medical.

Subjects were divided into two groups of 10 each. The young group had a mean age of 40.6 years and the old 78.8 years.

Experimental Procedure: Glomerular filtration rates, renal plasma flows and T_m diodrast or PAH were determined by the constant infusion technique as previously described (3). After equilibration, three 10-minute collection periods were used for estimation of G.F.R. and R.P.F. A priming dose of diodrast (or PAH) was then given, followed by an infusion to maintain high plasma levels of diodrast or PAH. Forty-five minutes after giving the priming dose, three additional 10-minute periods were run for estimation of T_m. Blood samples were obtained at the middle of each urine collection period from an in-dwelling needle in the femoral artery. Load/T_m ratios of 2-4 were realized in all experiments. Plasma protein levels were determined in each experiment to permit estimation of diodrast bound to protein from the nomogram of Smith and Smith (9). Mean values for the three periods were used in all calculations. In half the subjects, estimates of diodrast T_m preceded by 2-5 days' estimates of PAH T_m. The order was reversed in the other half of the subjects.

Analytic Methods: Inulin and diodrast concentrations in blood and urine were determined by methods previously described (4, 5). The method of Bratton and Marshall (1) was used for the estimation of PAH. Albumin was separated from the plasma by the method of Kingsley (6) and micro-Kjeldahl determinations of plasma albumin and total protein were made by the method of Ma and Zuazaga (7).

RESULTS

Table 1 gives mean values, uncorrected for surface area for old and young subjects. Values obtained for inulin clearance in the presence of low plasma levels of diodrast were the same as those observed at low levels of PAH. Values for T_m diodrast and T_m PAH have been reduced to mM excreted per minute and the ratio T_m diodrast/T_m PAH calculated for each subject. The mean value for this ratio was 2.45 ± 0.06 in the young and 2.48 ± 0.16 in the old subjects. There was also a close correlation between T_m diodrast and T_m PAH ($r = 0.972$).

Estimates of effective renal plasma flow, made with diodrast, were higher than PAH clearances in both young and old. The difference, however, was not statistically significant.

Self-Depression of Diodrast T_m: One patient exhibited the phenomenon of self-depression of T_m diodrast during one experiment. This depression occurred at plasma levels of diodrast in the range of 74-78 mg.%. When the procedure was

Submitted for publication July 10, 1956.

TABLE 1. MEAN VALUES FOR GFR, RPF, AND T_m DETERMINED WITH INULIN, DIODRAST, AND PAH IN YOUNG AND OLD SUBJECTS.

	Young Subjects N=10 Mn.	$\sigma_{Mn.}$	Old Subjects N=10 Mn.	$\sigma_{Mn.}$
Inulin Clearance (cc./min.)				
In presence of diodrast	101.1	± 11.6	45.1	± 4.7
In presence of PAH	103.1	± 8.7	48.0	± 5.2
Renal Plasma Flow (cc./min.)				
Diodrast clearance	598.2	± 45.8	250.9	± 27.1
PAH clearance	539.8	± 46.0	223.8	± 20.4
T_m				
Diodrast (mg.I/min.)	50.2	± 3.5	24.1	± 2.2
Diodrast (mM./min.)	0.198	± 0.014	0.095	± 0.009
PAH (mg./min.)	94.5	± 7.8	45.1	± 4.0
PAH (mM./min.)	0.487	± 0.041	0.233	± 0.020
Ratio T_m PAH/T_m Diodrast Using mM./min.	2.45	± 0.062	2.48	± 0.164

repeated, 9 days later at plasma levels of 37-38 mg.%, the depression was no longer apparent. Table 2 represents data from the two studies and includes time intervals and values for urine flow (V), concentration of diodrast in urine (U), and plasma diodrast concentration (P_D). Using data from January 28, 1954, as the patient's normal T_m diodrast, it can be seen that a depression of 70 per cent was obtained on January 19, 1954. The T_m showed signs of recovery from self-depression so that after 73 minutes, the T_m diodrast was 19.15 mg. I/min.; whereas at 49 minutes, after the large dose of diodrast given, the T_m diodrast value was only 5.92 mg./min. It will be noted that recovery occurred together with a drop in C_I (102 to 81), which lowered the relative amount of diodrast filtered and proportionately increased the amount excreted by the tubules. This was accompanied by a slight rise in the total amount of diodrast excreted (UV). With recovery of tubular excretion, the P_D was rising. The calculated tubular load was rising along with P_D. Urine flow remained nearly constant throughout.

TABLE 2. SELF DEPRESSION OF T_m DIODRAST. (44 year old male—weight 63.5 Kg.)

Date	T* min.	Cl_I cc./ min.	V cc./ min.	P_D mg.%	Cl_D cc./ min.	T_m Diodrast mg.I/ min.	Load/ T_m
1/19	29- 41	101.5	12.4	1.80	551.2		
	41- 63	104.6	14.9	1.86	557.5		
	63- 75	99.6	16.3	1.87	557.4		
	117-129	102.0	19.4	74.24	——	5.92	60.4
	129-141	88.1	17.6	78.24	——	14.65	26.3
	141-153	81.8	19.2	78.74	——	19.15	20.4
1/28	35- 47	88.1	11.5	1.63	581.6		
	47- 59	92.6	13.1	1.58	649.0		
	59- 71	80.6	14.8	1.53	647.5		
	103-115	68.0	18.6	38.58	——	43.5	5.1
	115-127	64.7	19.5	37.08	——	47.4	4.5
	127-139	81.9	20.1	37.58	——	43.1	4.9

* Time from beginning of infusion.

DISCUSSION

Although there was a high correlation between T_m diodrast and T_m PAH, it cannot be assumed that in individual subjects T_m diodrast can be accurately calculated from T_m PAH. However, for groups of subjects, an approximation can be made from the equation T_m PAH = 2.47 T_m diodrast when both T_m values are expressed as mM excreted per minute. Since no age difference in the ratio of T_m diodrast to T_m PAH was found, the relationship can be applied to both young and old groups of subjects. The value of the ratio does not differ significantly from the ratio of 2.33 ± 0.32 reported by Chasis and associates (2).

Although it is recognized that high plasma levels of diodrast will result in a depression of T_m, the number of published cases is relatively small. In the experiment reported here, load/T_m ratios of 20-26 were obtained with a marked reduction in T_m diodrast. During the course of the experiment, the T_m showed a tendency to increase even though high plasma levels were maintained. Thus, it would seem that the transport mechanism for diodrast by the renal tubule is able to re-establish itself in the face of a high plasma diodrast concentration.

SUMMARY

Glomerular filtration, effective renal plasma flow and T_m were determined in each of 20 male subjects using both diodrast and p-aminohippuric acid. The subjects were divided into a young (mean age 40 years) and old group (mean age 79 years).

1. The ratio $\frac{T_m \text{ PAH}}{T_m \text{ diodrast,}}$ calculated as mM/min., averaged 2.45 ± 0.06 for the young and 2.48 ± 0.16 for the old subjects.
2. The corrclation between T_m PAH and T_m diodrast was 0.972 in the total group of 20 subjects.
3. Inulin clearances were the same in the pres-

ence of low plasma concentration of diodrast or PAH.

4. Renal plasma flow, using PAH or diodrast was not significantly different.
5. One subject demonstrated the phenomenon of self-depression of T_m diodrast at plasma levels of 74-78 (load/T_m ratio of 20-26) with indications of recovery of T_m while plasma diodrast levels remained high.

REFERENCES

1. Bratton, A. C., and Marshall, E. K., Jr.: New Coupling Component for Sulfanilamide Determination. *J. Biol. Chem., 128:* 537-550, 1939.
2. Chasis, H., Redish, J., Goldring, W., Ranges, H. A., and Smith, H.: The Use of Sodium p-Aminohippurate for the Functional Evaluation of the Human Kidney. *J. Clin. Investigation, 24:* 583-588, 1945.
3. Davies, D. F., and Shock, N. W.: Age Changes in Glomerular Filtration Rate, Effective Renal Plasma Flow and Tubular Excretory Capacity in Adult Males. *J. Clin. Investigation, 29:* 496-507, 1950.
4. Flox, J., Pitesky, I., and Alving, A.: A Direct Photoelectric Colorimetric Method for the Determination of Diodrast and Iodates in Blood and Urine. *J. Biol. Chem., 142:* 147-157, 1942.
5. Harrison, H. E.: A Modification of the Diphenylamine Method for the Determination of Inulin. *Proc. Soc. Exper. Biol. & Med., 49:* 111-114, 1942.
6. Kingsley, G. R.: The Direct Biuret Method for the Determination of Serum Proteins as Applied to Photoelectric and Visual Colorimetry. *J. Lab. & Clin. Med., 27:* 840-845, 1942.
7. Ma, T. S., and Zuazaga, G.: Micro-Kjeldahl Determination of Nitrogen. *J. Indust. & Eng. Chem., 14:* 280-282, 1942.
8. Smith, H. W., Finkelstein, N., Aliminosa, L., Crawford, B., and Graber, M.: The Renal Clearances of Substituted Hippuric Acid Derivatives and Other Aromatic Acids in Dog and Man. *J. Clin. Investigation, 24:* 388-404, 1945.
9. Smith, W. W., and Smith, H. W.: Protein Binding of Phenol Red, Diodrast and Other Substances in Plasma. *J. Biol. Chem., 124:* 107-113, 1938.
10. Watkin, D. M., and Shock, N. W.: Agewise standard Values for C_{IN}, C_{PAH} and T_m PAH in Adult Males. *J. Clin. Investigation, 34:* 948, 1955.

AGING AND THE LATENCY AND DURATION OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT AND SOUND STIMULI

LILLIAN S. KUMNICK, PH.D.

(From the Department of Psychology, Fordham University, New York)

In previous articles (2, 3, 4, 5) the results of a study on aging and the pupillary response to light and sound stimuli employing pupillography revealed a progressive decrease in mean maxima and minima pupil diameters, extent of constriction, and response velocity with increasing age. No significant difference in the rate of change, efficiency of the pupillary mechanism, and the relative control of the iris over the amount of light striking the retina was noted, however, with increasing age. The present article is concerned with increasing age in relation to (a) the latency of pupil dilation and constriction; (b) the duration of pupil constriction; and (c) the occurrence of the maximum velocity of constriction.

MATERIAL AND METHOD

Cinephotography utilizing nonstimulating infrared illumination was used to record the size of the pupil as it alternately constricted and dilated in response to light stimuli (12.2 ft.-c.) of 1 sec. duration presented every 4 sec. The apparatus used and the method followed have been described elsewhere (2, 5). After dark adaptation of 10 minutes, 60 light stimuli were given to each subject to produce diminution of the pupillary response to light. Eight-tenths of a second after the sixtieth light stimulus an auditory stimulus (97 db.) was presented to elicit psychosensory restitution. The sound, loud, sudden, and having the character of a startle-eliciting stimulus, brought about sympathetic reaction. Approximately 15 more light stimuli were then given.

The measurements made of the pupil in a rested state (first response), in fatigue (average of fifty-ninth and sixtieth responses), in restitution (sixty-first response), and in decay of restitution (sixty-second response)* were: maxima and minima pupil diameters and the time between them; extent of pupillary constriction; and the amount of constriction or dilation in terms of 0.01 mm. within each successive tenth of a second.

Data were obtained for 94 ostensibly normal, white subjects between the ages of 7.5 and 90.8 years without known influencing pathologic conditions (2). The subjects were divided into 4 groups: Group I from 7.5 to 15.0 years, N = 21: Group II from 18.1 to 28.2 years, N = 25; Group III from 30.5 to 52.7 years, N = 24; Group IV from 70.4 to 90.8 years, N = 24.

RESULTS AND DISCUSSION

Inspection of tables 1 and 2 and fig. 1 suggests that (a) increasing age does not affect the latency of pupil constriction in response to light and sound stimuli, although age does affect the latency of pupil dilation in response to light stimuli; and that (b) the pupillary conditions of rest (I), fatigue (F), restitution (R), and decay of restitution (D) do affect the latency of pupil constriction in response to light and sound stimuli. The indications in (a) were confirmed by a simple analysis of variance of the data which yielded a nonsignificant F value for age and latency of pupil constriction, and a significant F value for age and latency of pupil dilation ($F = 7.15$, with 3 and 82 *df*, $p. < .001$); and the indication in (b) was confirmed by the analysis of variance technique for repeated measurements of the same subjects applied to the data which yielded significant F values ($F = 5.33$, with 3 and 249 *df*. $p. < .01$.

Latency of pupil dilation was computed for the initial response only (table 2) because dilation began during light stimulation for the fatigued, restituted, and decay of restitution responses (4, table 2). Therefore no analysis was made of pupillary conditions and the latency of pupil dilation.

Submitted for publication March 10, 1956.

This article reports an extension of the analysis of the data in a dissertation submitted to the Graduate School of Fordham University in partial fulfillment of the requirements for the Ph.D. degree. The writer wishes to express her indebtedness to Dr. Henryk Misiak, who directed this research, and to Dr. Otto Lowenstein, Director of the Laboratory of Pupillography, Institute of Ophthalmology, Columbia-Presbyterian Medical Center, New York, New York, where the experimental work was performed.

* For the purpose of this study, fatigue is defined as the reduction of pupillary functioning, after repeated light stimulations, which is shown in the lessened mobility of the pupil and in smaller responses; restitution as the reconstitution of the pupillary response; and decay of restitution as the diminution of pupillary restitution.

TABLE 1. MEAN LATENCY OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT STIMULI FOR THE 4 AGE GROUPS.

Pupillary Response	Age Group*	N	Latency (Sec.)
Initial	IV	23	0.226
	III	23	0.226
	II	23	0.222
	I	17	0.200
Fatigued	IV	21	0.243
	III	24	0.246
	II	23	0.244
	I	19	0.237
Restituted	IV	22	0.232
	III	24	0.242
	II	24	0.217
	I	19	0.174
Decayed	IV	22	0.277
	III	24	0.283
	II	24	0.246
	I	19	0.247

* I, 7.5-15.0 years.
II. 18.1-28.2 years.
III. 30.5-52.7 years.
IV. 70.4-90.8 years.

Since the *F* values for (a) age and latency of pupil dilation, and for (b) pupillary conditions and the latency of pupil constriction were significant, *t* tests were performed to test the significance of the differences between the possible pairs of means among the age groups and among the pupillary conditions. The results revealed significant differences at the .01 level of confidence for age and latency of pupil dilation between the old and young groups; and at the .05 level of confidence (marginal) for the pupillary conditions and latency of pupil constriction between I and D in Group III, F and R in Group I, and at the .01 level of confidence (marginal) for the pupillary conditions and latency of pupil constriction between R and D in Group I.

TABLE 2. MEAN LATENCY OF PUPIL DILATION IN RESPONSE TO LIGHT STIMULI FOR THE 4 AGE GROUPS.

Pupillary Response	Age Group*	N	Latency (Sec.)
Initial	IV	23	0.344
	III	23	0.313
	II	23	0.435
	I	17	0.500

* I, 7.5-15.0 years.
II. 18.1-28.2 years.
III. 30.5-52.7 years.
IV. 70.4-90.8 years.

The average constriction latency of the initial response was found to be 0.23 sec., 0.23 sec., 0.22 sec., and 0.20 sec. in Group IV, III, II, and I, respectively (table 1); and the average dilation latency for the initial response 0.34 sec., 0.31 sec., 0.44 sec., and 0.50 sec. in Group IV, III, II, and I, respectively (table 2).

Values of pupillary latencies in studies in the literature differ widely due to the variety of method and purposes involved. Lowenstein (6) found the values for the latency period of constriction in subjects up to 50 years of age to range from 0.2 to 0.3 sec. Bender (1) in a study of 19 individuals aged 18 to 32 years found a latent period of about 0.2 sec. preceding constriction. His results indicated that ingestion of certain amounts of alcohol increased constriction latency. At 7.47 mm. a mean latency for constriction following stability was found to be 0.175 sec.; a latency for dilation after stability 0.180 sec. by Young and Biersdorf (8) for subjects ranging in age from 21 to 29 years. Talbot (7) found an average constriction latency of 0.25 sec. and a dilation latency of about 0.4 sec. in a quantitative study of the responses of one individual. Whereas Talbot found a decrease both in constriction latency

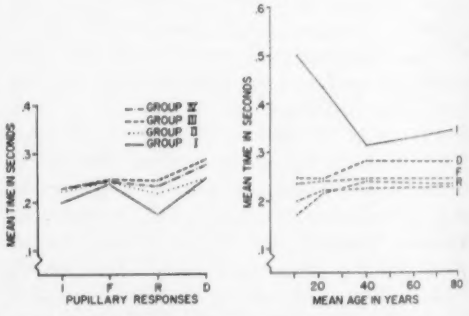


Fig. 1. Left: Mean latency of pupil constriction in response to light stimuli within the 4 age groups.

I, Initial or rested pupil.
F, Pupil in fatigue.
R, Pupil in restitution.
D, Pupil in decay of restitution.

Right: Mean latency of pupil constriction and dilation between the 4 age groups. Dark, dilation latency; Light, constriction latency:

I, 7.5-15.00 years, N = 19.
II, 18.1-28.2 years, N = 24.
III, 30.5-52.7 years, N = 24.
IV, 70.4-90.8 years, N = 23.

and in dilation latency with decrease in original diameter (at 6.5 mm. average constriction latency is 0.28 sec.; at 4 mm. average constriction latency is 0.23 sec.), the writer found a reverse trend (tables 3 and 4). The constriction latency in the present study was found to vary with original diameter but not as much as the dilation latency. It is evident that the two latencies behave differently, which provokes further study.

The latency period for pupil dilation was found to be shorter for the old individuals than for the young subjects (table 2). This would seem to be somewhat unexpected. The latency period for dilation does not seem to be affected by the latency period for constriction, as no significant age differences were found in the latter. Table 3 shows that dilation latency seems to be independent of the constriction latency. However, there may be a relationship between dilation latency and the duration of pupil constriction, and between dilation latency and the velocity of pupil constriction. Significant age differences were found in these areas (for pupil dilation latency—$F = 7.15$, with 3 and 82 df, $p < .001$; for duration of pupil constriction—$F = 7.62$, with 3 and 88 df, $p < .001$; for velocity of pupil constriction see ref. 3, table 2). Dilation latency seems shorter (a) following shorter constriction duration (table 5), and (b) following reduced velocity of response (table 7).

Table 3 reveals a relationship between original pupil diameters and latency of pupil dilation, the shorter dilation latencies occurring in the old group with the smaller original pupil diameters, and the longer dilation latencies in the young group with the larger original pupil diameters. The size of the original pupil diameter decreased with increasing age (table 3). Talbot (7) also found a shorter dilation latency on the average with reduced original pupil diameter.

TABLE 3. MEAN PUPIL CONSTRICTION AND DILATION LATENCIES FOR FAMILIES OF RESPONSES HAVING SIMILAR ORIGINAL PUPIL DIAMETERS.*

Range (Mm.)	N	Initial Response		Age Range (Years)†	
		Constriction (Sec.)	Dilation (Sec.)	7–28 N	30–91 N
2.50–2.99	1	0.400	0.200		
3.00–3.49	4	0.200	0.275		
3.50–3.99	1	0.100	0.300		
4.00–4.49	5	0.260	0.220	9	33
4.50–4.99	9	0.233	0.289		
5.00–5.49	7	0.229	0.386		
5.50–5.99	15	0.247	0.393		
6.00–6.49	10	0.220	0.360		
6.50–6.99	15	0.187	0.460		
7.00–7.49	8	0.200	0.450	31	13
7.50–7.99	6	0.183	0.500		
8.00–8.49	4	0.225	0.525		
8.50–8.99	1	0.300	0.500		

* Within a range of 0.25 mm. either direction from a mean.

† 9 = number of subjects within age range 7-28 years
33 = number of subjects within age range 30-91 years having original pupil diameters within range of 2.50-5.99 mm.
31 = number of subjects within age range 7-28 years
13 = number of subjects within age range 30-91 years having original pupil diameters within range of 6.00-8.99 mm.

TABLE 4. MEAN LATENCY OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT STIMULI FOR FAMILIES OF RESPONSES HAVING SIMILAR ORIGINAL PUPIL DIAMETERS.*

Range (Mm.)	Pupillary Conditions							
	Initial		Fatigued		Restituted		Decayed	
	N	Mean (Sec.)	N	Mean (Sec.)	N	Mean (Sec.)	N	Mean (Sec.)
2.50–2.99	1	0.400	1	0.100				
3.00–3.49	4	0.200	1	0.300	2	0.250	2	0.350
3.50–3.99	1	0.100	7	0.229	2	0.250	4	0.225
4.00–4.49	5	0.260	6	0.267	5	0.280	6	0.283
4.50–4.99	9	0.233	15	0.220	7	0.214	11	0.291
5.00–5.49	7	0.229	21	0.252	13	0.223	14	0.229
5.50–5.99	15	0.247	11	0.218	15	0.233	20	0.255
6.00–6.49	10	0.220	15	0.240	21	0.171	15	0.267
6.50–6.99	15	0.187	8	0.288	14	0.214	12	0.258
7.00–7.49	8	0.200	2	0.300	7	0.243	4	0.300
7.50–7.99	6	0.183			3	0.267	1	0.400
8.00–8.49	4	0.225						
8.50–8.99	1	0.300						

* Within a range of 0.25 mm. either direction from a mean.

TABLE 5. MEAN DURATION OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT STIMULI FOR THE 4 AGE GROUPS.

Pupillary Response	Age Group*	N	Duration (Sec.)
Initial	IV	24	1.183
	III	24	1.175
	II	24	1.333
	I	20	1.355
Fatigued	IV	23	0.889
	III	24	0.873
	II	25	0.880
	I	20	0.900
Restituted	IV	23	0.909
	III	24	0.871
	II	25	0.908
	I	21	0.814
Decayed	IV	22	0.905
	III	24	0.950
	II	25	0.952
	I	20	0.850

* I, 7.5-15.0 years.
II. 18.1-28.2 years.
III. 30.5-52.7 years.
IV. 70.4-90.8 years.

TABLE 6. MEAN DURATION OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT STIMULI FOR FAMILIES OF RESPONSES HAVING SIMILAR ORIGINAL PUPIL DIAMETERS.*

Range (Mm.)	Pupillary Conditions							
	Initial		Fatigued		Restituted		Decayed	
	N	Mean (Sec.)	N	Mean (Sec.)	N	Mean (Sec.)	N	Mean (Sec.)
2.50–2.99	1	1.00	2	0.80				
3.00–3.49	4	1.08	1	0.95	2	0.90	2	0.85
3.50–3.99	1	1.20	7	0.88	2	1.10	4	0.90
4.00–4.49	6	1.05	7	0.81	5	0.82	6	0.87
4.50–4.99	9	1.08	15	0.88	7	0.86	11	0.86
5.00–5.49	7	1.27	22	0.88	14	0.90	14	0.96
5.50–5.99	15	1.28	11	0.90	15	0.87	20	0.93
6.00–6.49	10	1.23	17	0.91	21	0.90	16	1.02
6.50–6.99	16	1.34	8	0.89	16	0.87	13	0.85
7.00–7.49	9	1.31	2	1.00	8	0.81	4	0.78
7.50–7.99	9	1.39			3	0.83	1	0.90
8.00–8.49	4	1.42						
8.50–8.99	1	1.40						

* Within a range of 0.25 mm. either direction from a mean.

Inspection of table 5 and fig. 2 suggests that (a) increasing age affects the duration of pupil constriction in response to light stimuli in the initial (rested) response only; and that (b) the pupillary conditions (I, F, R, D) affect the duration of pupil constriction in the 4 age groups. The indication in (a) was confirmed by a simple analysis of variance of the data which yielded a significant F value for age and the duration of pupil constriction for the initial response only ($F = 7.62$, with 3 and 88 df, $p < .001$); and the indication in (b) was confirmed by the analysis of variance technique for repeated measurements on the same subjects applied to the data which yielded significant F values ($F = 191.64$, with 3 and 262 df, $p < .001$). Since the F values for (a) age and duration of pupil constriction for the initial response, and for (b) the pupillary conditions and the duration of pupil constriction were significant, t tests were performed to test the significance of the differences between the possible pairs of means among the age groups and among the pupillary conditions. The results revealed significant differences at the .01 level of confidence for age and duration of pupil constriction between the old and young groups; and at the .01 level of confidence for pupillary conditions and duration of pupil constriction between I and F, I and R, and I and D in all the age groups. The changes in the duration of pupil constriction in response to light stimuli which may be attributed to increasing age seem to be masked by the changes induced in the response by the conditions of fatigue, restitution, and decay of restitution (table 5 and fig. 2).

The average duration of pupil constriction during the initial response to light stimuli was found to be 1.18 sec., 1.18 sec., 1.33 sec., and 1.36 sec. for Group IV, III, II, and I respectively (table 5). It was found to vary with original diameter, increasing with the increase of pupil diameter (table 6).

The average maximum velocity per 0.1 sec. was found to decrease with increasing age and to occur later during the sec. of light stimulation in the older groups (table 7).

SUMMARY

The results of a study of pupil latencies, duration of pupillary constriction, amount of movement in terms of 0.01 mm. within each succes-

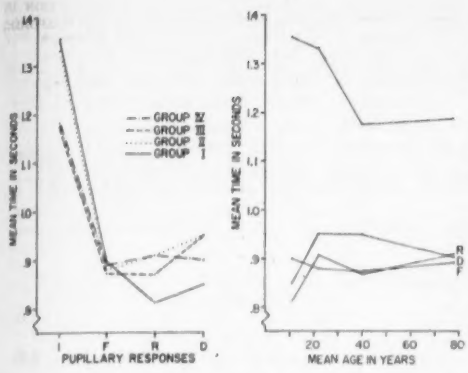


Fig. 2. Left: Mean duration of pupil constriction in response to light stimuli within the 4 age groups.

I, Initial or rested pupil.
F, Pupil in fatigue.
R, Pupil in restitution.
D, Pupil in decay of restitution.

Right: Mean duration of pupil constriction in response to light stimuli between the 4 age groups.

I, 7.5-15.0 years, N = 21.
II, 18.1-28.2 years, N = 25.
III, 30.5-52.7 years, N = 24.
IV, 70.4-90.8 years, N = 24.

TABLE 7. MEAN MAXIMUM VELOCITY OF PUPIL CONSTRICTION IN RESPONSE TO LIGHT STIMULI FOR THE 4 AGE GROUPS.

Pupillary Response	Age Group*	Velocity (Mm./0.1 Sec.)	Occurrence† (Sec.)
Initial	IV	0.43	0.50
	III	0.46	0.46
	II	0.51	0.45
	I	0.54	0.46
Fatigued	IV	0.41	0.45
	III	0.59	0.42
	II	0.65	0.41
	I	0.65	0.41
Restituted	IV	0.46	0.46
	III	0.58	0.45
	II	0.63	0.45
	I	0.64	0.44
Decayed	IV	0.45	0.45
	III	0.59	0.42
	II	0.63	0.43
	I	0.63	0.42

* I, 7.5-15.0 years.
II, 18.1-28.2 years.
III, 30.5-52.7 years.
IV, 70.4-90.8 years.

† Time in seconds after the onset of the constriction at which the maximum velocity was recorded.

sive tenth of a second, and of the time in seconds after the onset of the constriction at which the maximum velocity was recorded, in relation to aging, based on data obtained by means of pupillography for 94 apparently normal subjects between the ages of 7.5 and 90.8 years revealed:

1. The latency of pupil constriction is not affected by increasing age, but is affected significantly by the pupillary conditions of restitution and decay of restitution at certain age levels.

2. The latency of pupil dilation is affected significantly by increasing age in the initial (rested) response.

3. The two latencies (constriction and dilation) seem to behave differently in relation to original diameter (at onset of light stimulation), the latency of pupil constriction showing much less increase than the latency of pupil dilation with increase of original diameter. The size of the original pupil diameter decreased with increasing age.

4. The duration of pupil constriction is affected significantly by increasing age in the initial (rested) response and by the pupillary conditions of fatigue, restitution, and decay of restitution in the 4 age groups.

5. The average duration of pupil constriction varies with original diameter, increasing with increase of original diameter. The average velocity per 0.1 sec. decreases with increasing age and occurs later in the second of stimulation in the older groups.

The results evidence the importance and usefulness of pupil latencies and duration of pupil constriction in response to light stimuli, even though they have small ranges, in the study of the aging process, as well as in many physiologic and pathologic conditions.

The results also point out the need for the employment of a variety of experimental conditions in the pupillographic study of pupillary behavior in order to evaluate the dependence of the results upon them.

REFERENCES

1. Bender, W. R. G.: The Effect of Pain and Emotional Stimuli and Alcohol upon Pupillary Reflex Activity. *Psychol. Monogr., 44:* No. 2, 1-32, 1933.
2. Kumnick, L. S.: Pupillary Psychosensory Restitution and Aging. *J. Optic. Soc. America, 44:* 735-741, 1954.

3. Kumnick, L. S.: Aging and Pupillary Response to Light and Sound Stimuli. *J. Gerontol., 11:* 38-45, 1956.
4. Kumnick, L. S.: Aging and Decay of Pupillary Psychosensory Restitution. *J. Gerontol., 11:* 46-52, 1956.
5. Kumnick, L. S.: Aging and the Efficiency of the Pupillary Mechanism. *J. Gerontol., 11:* 160-164, 1956.
6. Lowenstein, O.: Clinical Pupillary Symptoms in Lesions of the Optic Nerve, Optic Chiasm, and Optic Tract. *Arch. Ophth., 52:* 385-403, 1954.
7. Talbot, S. A.: *Pupillography and the Pupillary Transient.* Unpubl. Ph.D. thesis, Harvard University, 1938.
8. Young, F. A., and Biersdorf, W. R.: Pupillary Contraction and Dilation in Light and Darkness. *J. comp. Physiol. Psychol., 47:* 264-268, 1954.

GERIATRIC PRACTICE

THE CONTROL OF ARTERIAL HYPERTENSION IN OLDER INDIVIDUALS

HENRY A. SCHROEDER, M. D.

REVERSAL AND CONTROL OF GENERALIZED VASOSPASM

Hypertension is defined as a condition of chronic generalized vasospasm, in which other circulatory functions can be normal or adequate. A *diastolic* blood pressure of 90 mm. Hg or more is an essential accompaniment. This condition is not to be confused with pure *systolic* hypertension, which results from loss of aortic elasticity or increase in cardiac output and not generalized vasospasm. Modern drugs merely counteract vasospasm and therefore are useless or hazardous in its absence. Obviously it is of dubious value to lower a blood pressure of 200/90 to 140/30, and this is exactly what our present potent antihypertensive drugs might be expected to do in the case of a pure systolic hypertension due to atherosclerosis and the resulting loss of vascular elasticity.

The several factors which in general cause vasospasm are a) those acting through sympathetic vasoconstrictor nerves, b) those, usually coming from the kidneys, acting directly on the smooth muscle of blood vessels, and c) those, usually arising in the adrenal cortex, acting indirectly on blood vessels by increasing their reactivity to other stimuli. Each case differs in the relative degree of influence of each factor. The agents and measures commonly in use are similarly grouped: a) those acting to block or suppress sympathetic nervous impulses, b) those acting on vascular smooth muscle and also inactivating humoral pressor substances, and c) those affecting vascular smooth muscle by interfering with salt-steroid relationships of the adrenal cortex. In most cases two differently acting drugs or procedures must be used for successful therapy, doses depending upon the relative strength of each influence in the total process.

From the Hypertension Division, Department of Internal Medicine, Washington University School of Medicine, and Barnes Hospital, St. Louis, Missouri.

Published on a grant from the Forest Park Foundation to the Journal of Gerontology.

The most commonly available drugs will be discussed in terms of their primary actions and their side effects, in which all are offenders. In terms of rates of action, however, which are of especial interest to us in treating atherosclerotic patients whose cardiovascular systems cannot stand marked fluctuations in hemodynamics, we can classify them as follows: slowly acting—reserpine, hydralazine; violently acting—ganglionic blocking agents, protoveratrine.

Drugs acting directly or indirectly on central sympathetic areas: Reserpine, a mild antihypertensive agent, is widely used. It acts by displacing serotonin from receptors in cortico-hypothalamic tracts, especially those leading to the posterior (sympathetic) portion of the hypothalamus. These receptors are blocked for several days. The net result is a relative parasympathetic overactivity. This drug also releases serotonin from platelets and intestine, producing depletion. Its usual side effects are many and frequent; those resulting from parasympathetic overactivity are bradycardia, gastric hyperacidity, gastrointestinal hypermotility; those probably from serotonin depletion are loss of affect, drive, ambition, the ability to form new concepts (i.e., symptoms similar to prefrontal lobotomy), and nasal stuffiness, which has occasionally led to epistaxis in older individuals with atherosclerotic arteries. More serious "late" side effects, possibly due to excessive depletion of serotonin, are anxiety, nervousness, insomnia, wild dreams and nightmares, and eventually agitated depressive psychosis with suicidal tendencies, the last of which places it among the drugs with occasional fatal reactions. Return of function after a psychosis has developed may be delayed for several weeks or months.

Chlorpromazine is also a serotonin antagonist, although its primary action is not to paralyze serotonin receptors, but rather to affect the vasomotor center in some manner, resulting

in fall of blood pressure and bradycardia. It has many side effects, and is not valuable as an antihypertensive agent other than indirectly through sedation.

Protoveratrine acts by stimulating the carotid sinus and aortic depressor nerves (the baroreceptors), thus causing an increase in their depressor activity. The pathway is through the glossopharyngeal nerve to the vasomotor center. Side effects are those due to vagal stimulation, bradycardia, increased gastrointestinal motility, gastric hyperacidity, nausea, and vomiting. Intermittent hypotension or normotension can be achieved only by careful regulation of dose.

Drugs acting to interrupt somatic autonomic nerves: There are two areas where sympathetic nerve transmission to blood vessels can be interrupted by drugs, at ganglia or at nerve endings. An effective, safe, and long acting sympatholytic agent which does not produce tachycardia is not available; therefore ganglionic blockade is the necessary alternative. A great many agents are available; 4 will be discussed. All have side effects mainly due to parasympatholysis, since the action of these drugs seems to lie in their ability to displace acetyl choline or its analogues in ganglia, thereby inhibiting transmission at acetyl choline-mediated synapses. Three, as examples of a whole spectrum, contain tetracovalent nitrogen (quaternary ammonium), as does acetyl choline; special spatial configurations in their molecules apparently cause their predilections for autonomic ganglia, just as other configurations of tetracovalent nitrogen promote predilections for acetyl choline inhibition at myelinated nerve endings on striated muscle (curare, succinyl choline, decamethonium ion, and other curariform drugs, for example).

The actions of hexamethonium and pentolinium (Ansolysen) ions and chlorisondamine (Ecolid) are similar, differing only in slight degree in duration of action but with divergent rates of absorption from the gastrointestinal tract. In terms of oral potency, pentolinium ion is about 5 times as effective as hexamethonium ion, while chlorisondamine is twice as strong as pentolinium. The durations of action are similar, about 3 to 6 hours after a single dose, hexamethonium ion being shortest, pentolinium ion being intermediate and chlorisondamine being longest, in general (table 1).

A newer agent, mecamylamine, is a secondary ammonium compound with a camphor-like ring structure. It remotely resembles another camphor compound, trimethaphan camphor sulfonate (Arfonad), also with trivalent nitrogen blocking ganglionic transmission. While parasympatholysis is as great as the desired sympatholysis, the sole advantage in this drug lies in its virtually complete absorption from the gastrointestinal tract. Thus, dose for dose, it is about 50 times as potent as hexamethonium ion and 10 times as potent as pentolinium ion. It has one serious drawback. In individuals with malignant hypertension and poor renal function, in high doses it has produced a most distressing disturbance, characterized by generalized severe coarse or flapping tremor (disappearing with sleep) and intense anxiety. The syndrome resembles delirium tremens and not Parkinsonism; hallucinations have developed; recovery has taken 1 to 3 weeks after discontinuation of the drug and substitution of another agent. This toxic action is probably on a local area of the brain.

Parasympatholysis accompanies sympatholysis. The symptoms of parasympatholysis include almost the entire gamut of unpleasant effects from ganglionic blockage. They are in the order of decreasing severity: hypomobility of the gastrointestinal tract, difficulty in voiding, loss of visual accommodation, diminished salivation, decreased sweating, and loss of temperature control.

TABLE 1. COMPARATIVE DOSES OF GANGLIONIC BLOCKING AGENTS* (SEVERE ADULT HYPERTENSION).

Ion	Usual Effective Oral Dose		Maximum Tolerated Oral Dose		Duration of Action of Oral Drug	Usual Effective Parenteral Dose‡
	Single Dose mg.	Daily Dose mg.	Single Dose mg.	Daily Dose mg.	hrs.	Single Dose mg.
Tetraethyl Ammonium					¼-1†	500
Pentamethonium	500	2500	?	?	3	25
Hexamethonium	500	2500	1000	6000	4	25
Pentolinium (Ansolysen)	100	500	800	4000	4-5	25
Chlorisondamine (Ecolid)	50	250	200	1000	4-6	15
Mecamylamine (Inversine)	10	50	25	150	4-8	10

* When combined with hydralazine.

† Sublingual doses effective, oral not.

‡ *Initial* dose much smaller. Wide variation as tolerance develops.

The serious side effects of parasympatholysis *per se* in older atherosclerotic individuals are generally those caused by atony of a hollow organ already partially obstructed by disease, leading to complete obstruction. Prostatic hypertrophy of a degree giving few symptoms may become obvious by complete or marked retention of urine when ganglionic blockade is added. In that event, a choice must be made between discontinuation of the drug, frequent catheterization, or transurethral prostatectomy. Likewise obstruction of a portion of the gastrointestinal tract can occur when previous adhesions are present, obstruction of the Eustachian tube after long standing recurrent pharyngitis, and obstruction of the pylorus after old peptic ulcer. We have not observed obstruction of the cystic or common bile ducts.

Another side effect occasionally seen with the use of gangionic blocking agents is a marked fluctuation in blood pressure. The hazards associated with violent fluctuations of blood pressure in aged patients are due to the presence of localized arteriosclerosis. Ischemia, caused by lower blood pressure through a vessel which cannot dilate to the same extent as can the remainder of the vascular system, or thrombosis, formed on an atherosclerotic plaque during a period of low blood flow, may result. The exact mechanism of thrombosis is not known, but lessened flow through a vessel promotes it. Thus, cerebral thrombosis, mesenteric thrombosis, coronary thrombosis have occurred, albeit rarely. They must be kept in mind during every course of therapy in atherosclerotic individuals. Some fundamental biochemical alteration may be common to both atherosclerosis and thrombotic tendencies. Ischemia has resulted in temporary loss of memory and mental depression, worsening of anginal pain (rare), and temporary depression of renal function (not to the extent of azotemia, however). The possibility of cerebral hemorrhage resulting during temporary periods of very high pressure is largely obviated by adequate control.

One ganglionic blocking agent, hexamethonium chloride, has produced a usually fatal pulmonary disease, interstitial fibrosis of the lungs, in patients exhibiting malignant hypertension with azotemia. Poor and intermittent control of hypertension has been the rule; only one individual, treated with cortisone, has recovered. Tachypnea worsened in the sitting or standing position is the cardinal sign. The lesions resemble closely those of "uremic pneumonia." We have not observed such cases for several years, probably because other ganglionic blocking agents are more popular and control of hypertension is better achieved. The incidence is higher in groups where moderate diastolic hypertension (110 mm. Hg or less) is the aim of therapy than when it is lower (90 mm. Hg or less).

Drugs acting directly on vascular smooth muscle: There is only one long acting agent available, hydralazine (and its direct derivatives), although a number of others have short actions or other unwanted qualities, such as nitrites, azides, 2,3-dimercaptopropanol, nitroprusside (effective intravenously), thiocyanate (often toxic). Hydralazine (Apresoline) and 1, 4-dihydrazinophthalazine (Nepresol) have two actions: a) they inactivate hypertensin (angiotonin) and pherentasin, the humoral pressor substance in hypertensive blood, and b) they dilate *constricted* vascular smooth muscle, constricted in response to many pressor agents. Hydralazine also acts very fundamentally upon several enzyme systems, inhibiting histaminase and certain amino acid decarboxylases, while it enhances the activity of monamine oxidase, the enzyme which deaminates many vasoactive amines such as norepinephrine, tyramine, serotonin, pherentasin, and hypertensin. Thus, by inhibiting decarboxylation and enhancing deamination, primary (pressor) amine formation by the ischemic kidney is counteracted, effects theoretically ideal for the treatment of hypertension caused by humoral agents. A unique action is that of renal vasodilation, counteracting the ischemia resulting from hypertension.

Toxic side effects are many, and can be considered as early, due to failure of destruction of histamine, and late, due either to the development of drug sensitivity, or to depletion from the body of some essential substance. Because hydralazine is a metal chelator, presumably both early and late effects can be caused by removal of trace metals from metalloenzymes, such as the decarboxylases, which contain vitamin B_6 and a metal, or the oxidases, which usually contain metals. Both hypertensin and pherentasin require a metal for activity.

The early side effects (of histamine accumulation) include flushing, nasal stuffiness, aching in the joints, headache, lassitude, and prostration. The late toxicity resembles disseminated lupus erythematosus; this syndrome is reversi-

ble and occurs in 10 per cent of patients or less. Hydralazine is a unique and valuable drug; there is great need for another with similar actions to replace it when toxicity appears.

Agents and procedures acting indirectly on smooth muscle by altering salt-steroid relationships: The salt retaining hormone of the adrenal cortex (aldosterone) probably sensitizes the smooth muscle of blood vessels to vasoconstrictor substances, presumably by promoting alterations in sodium and potassium or magnesium and calcium within the cell. This statement is based on the analogy of its actions with those of desoxycorticosterone acetate (DCA), another salt-retaining steroid. Increase of sodium or potassium results in hypersensitivity; increase of magnesium or calcium lessens sensitivity. Both sodium plus hypercorticism are necessary for this reaction; either depletion of salt or hypocorticism negates the reaction. While there are no available metabolic antagonists to aldosterone, one competing with DCA prevents salt and DCA hypertension in animals and experimentally will sometimes lower blood pressure in man. The need for such antagonists is obvious.

Depletion of body sodium by severe restriction of dietary salt (0.5 Gm. per day) will result in the same end by a different pathway. The adrenal cortex is stimulated to overactivity by salt depletion, which causes renal salt retention, which in turn must be overcome by the very low intake. Furthermore, the hypertensive kidney is a salt-losing kidney, a factor which in turn leads either to mild hypercorticism or excessive craving for salt. Too severe salt depletion will lead to the low-salt syndrome, with renal insufficiency and death. Therefore, salt restriction of a degree sufficient to lessen vascular reactivity must be carefully achieved, in order to avoid both insufficient and excessive loss of sodium. The relatively few fatal reactions indicate the error is largely on the side of insufficient depletion.

METHODS FOR CONTROLLING HYPERTENSION IN OLDER PERSONS

In general symptoms associated with hypertension in older patients are quite similar to those found in younger individuals with the addition of others probably caused by cerebral atherosclerosis. Thus, dyspnea, the earliest sign of left ventricular insufficiency, is common to both groups. Severe headache is less common in older persons, but tinnitus, vertigo, paraesthesias, transient paralyses, and the like are more common as a rule.

Malignant hypertension, which always has a large nephrogenic component, is more common in young than in old persons; when it does occur in old individuals, either organic renal diseases or severe atherosclerotic stenosis of one or both renal arteries are to be expected. The hemodynamic pattern of renal plasma flow through the glomerulus is usually different in the older patient, showing predominantly afferent, rather than efferent, arteriolar constriction. The relative importance of neurogenic and nephrogenic factors in maintaining diastolic hypertension as a function of age is unknown. Our ability to measure the contribution of each of these factors in individual cases is entirely too limited to permit any definite answer. On the whole it may be presumed that when diastolic hypertension is present the same factors are active in old as in young people.

The methods for control of geriatric hypertension are basically similar to those for control in younger individuals, with these differences:

1. The blood pressure is reduced slowly and carefully.

2. An attempt is made to bring the systolic pressure to normotensive levels only if a high pulse pressure is not present, although the diastolic pressure is kept between 90 and 70 mm. Hg when possible. It must be remembered that the aim of therapy is sustained diastolic normotension. Simultaneous systolic normotension is possible only if vascular elasticity has been maintained.

The fundamental rationale of treatment is to use one agent acting on nerves and one agent acting either directly or indirectly on vascular smooth muscle. Both influences, sympathetic nerves and humoral pressor substances, are operative in all but the mildest cases, and therefore usually both must be opposed. This means, in direct terms, the use of hydralazine or salt-depletion with one or more drugs acting on nerves, either reserpine, protoveratrine, or a ganglionic blocking agent. The physician must remember constantly that only the vasospasm is being counteracted by drugs.

The majority of older patients with mild or moderate hypertension have a reasonable life expectancy without antihypertensive therapy.

The difficulty with regard to the decision on institution of antihypertensive treatment is that no one can predict with any great certainty who is going to have a vascular accident and who is not. As a general directive it may be stated that if a patient is asymptomatic as far as his hypertension goes and if he has had essentially the same degree of hypertension for many years, it is justifiable not to treat him. A whole host of factors, such as the degree of hypertenson, its fixity, the extent of cardiomegaly, evidence of coronary insufficiency, presence of renal dysfunction, symptoms of cardiac failure, or complaints of any kind, constitute the criteria for treatment, which could then be tapered off if an *adequate* trial proved of no value. In general terms we differentiate mild, moderate, and severe benign hypertension as diastolic pressure which is rarely, usually, or always elevated, respectively. A sodium amytal test will usually permit differentiation between moderate and severe hypertension, although, of course, other secondary changes, such as cardiomegaly, must be taken into account. There is no significant danger connected with the performance of the sodium amytal test. To sum it up, a patient should be given antihypertensive therapy if in the opinion of the physician high blood pressure will cause him significant difficulty during the time he might otherwise be expected to live. There is no excuse in this day and age for any patient to have sustained diastolic hypertension unless he or she so chooses. The burden of proof is on the physician who chooses not to treat, for he must be responsible for the consequences in terms of vascular accident, left ventricular failure, and progressive renal insufficiency. In well treated patients, congestive heart failure, which formerly accounted for 40 to 55 per cent of deaths, has virtually disappeared, cerebral hemorrhage has become rare, and progressive renal insufficiency has ceased to progress.

In general, the most difficult patients to treat are men with benign stages of hypertension with aortic atherosclerosis manifested by tortuous aortas, probably with renal arterial plaques. The easiest patients to treat are those with malignant stages who have not yet developed azotemia. The most unrewarding group of patients are those treated on an ambulatory basis only by reserpine, with or without hydralazine, because the severity of hypertension was not considered serious enough to warrant ganglionic blockade.

In office practice, a patient with mild or moderate hypertension, who in the judgment of his physician is considered unlikely to have an apoplectic stroke, a coronary occlusion or an attack of pulmonary edema within the next month, can be started on reserpine 1.0 to 0.5 mg. once a day and his blood pressure and symptoms followed at weeky intervals. Within a month close to the maximal effect will have been observed. Hydralazine is then initiated, effective doses being 300 to 400 mg. per day in divided doses. Maximal effect will have been observed within 2 to 4 months. The efficacy of hydralazine in relieving muscular spasm does not depend on age; because it is a slow acting drug its safety is relatively greater than more potent agents. It is essential that intermittent therapy be avoided, for there is no better way of producing tolerance than by "nervous" therapy. If the diastolic pressure has not come to 90 mm. Hg or below, the patient becomes a candidate for ganglionic blockade or protoveratrine; only the latter agent should be initiated out of hospital. A strict low-salt regimen can be started at this time, if there are reasons that ganglionic blockade is momentarily contraindicated.

All patients with severe benign hypertension, all patients with ocular fundi showing hypertensive retinopathy, grade III or IV (Keith-Wagener), and all patients not responding to milder measures should be admitted to hospital and combined therapy instituted. Since the end point is death, and since no physician has the judgment or knowledge to pick out those patients who will live with their hypertension (about 20 per cent of older individuals) and those who will not, the stakes are high and experiment perilous.

In hospital, ganglionic blocking agents and hydralazine should be given orally every four hours day and night; the agent is a matter of preference, although hexamethonium chloride has become obsolescent. The blocking agent cannot be given in a constant dose, but must be administered on a sliding scale depending upon the level of systolic blood pressure; otherwise either hypertension or hypotension and collapse are inevitable consequences. This means that at home the patient must learn to take his own blood pressure, just as a diabetic must learn to test his own urine. Parasympatholytic side effects are treated as they arise, for ganglionic blockade is one of the few situations where it is justifiable to set one pharmacologic thief to

catch another. Constipation must be avoided by the daily use of laxatives.

As mentioned previously, compromises with strict systolic normotension are made for aortic atherosclerotic individuals, but no compromise is made with sustained diastolic normotension (mean, 90 mm. Hg. or less). As doses are slowly increased, each fluctuation of systolic pressure downward gives the physician confidence in the ability of the patient to tolerate that level sustained for at least a few hours, and thus lower levels can be reached. Careful handling of dosage, slowly increased but continuous therapeutic pressure, waiting until symptoms resulting from hemodynamic changes subside, encouragement of the patient, precautions to prevent hypotension and obstipation are the secrets of successful management; deviations are met at the least with failure and at the most with a vascular accident.

No two antihypertensive drugs can be given in a constant ratio. Therefore, single drugs should be used separately, the dose of each either varying constantly, as in the cases of ganglionic blocking agents or protoveratrine, or being relatively even, as in the cases of hydralazine and reserpine; both drugs must be altered to fit each case and the influence they were designed to counteract. Pousse café combinations of drugs are misleading and the "baked Alaska" variety (two oppositely acting agents) full of pharmacologic traps. Reserpine contained in "spansules" is no more justifiable than digitalis or cortisone in "spansules," although ganglionic blocking agents might be so improved could the correct dose be ascertained. When proper and careful treatment of hypertension is accomplished, the mortality will be largely the result of atherosclerosis.

BOOK REVIEWS

MANAGEMENT OF PAIN IN CANCER, edited by M. J. Schiffrin, Year Book Publishers, Inc., Chicago, 1956, 245 pages, $4.50.

In this modern day of curative medicine, it is extremely valuable to have a book which re-emphasizes the problem of symptom relief in an important area where more definitive therapy frequently fails.

Just such a book is this one by Dr. Schiffrin and his colleagues. The format is simple and logical and covers the entire range from systemic analgetics to the psychologic aspects of the problem. In the remaining 5 sections, nerve blocks and neurosurgical management of pain; general surgical procedures, radiation therapy, and palliative chemo and hormonal therapy are considered.

Each of these chapters has been written by a person obviously well-versed in the use of moiety under consideration and emphasis has been placed on the practical applications. The information given is clear and not heavily weighted with theoretic material but rather succinctly states the rationale indications, the contraindications and essential details for each type of therapy.

This book should be, therefore, of great value to the practitioner who is daily faced with the problem of the cancer patient who is having pain. Similarly, it should be an excellent book for use in teaching this area of medicine to professional students.

The patient suffering with this unfortunate condition should benefit greatly by the stimulation which the book provides to the practitioner who seeks the optimal method for the amelioration of the symptomology.

MARK H. LEPPER, M.D., Head
Department of Preventive Medicine
University of Illinois College of Medicine

BOOKS RECEIVED

Books received since July 1 are acknowledged in the following list.

Histamine, by G. E. W. Wolstenholme and Cecilia M. O'Connor. Ciba Foundation Symposium Jointly with the Physiological Society and the British Pharmacological Society. Little, Brown and Company, Boston, 1956, 472 pages, $9.00.

Management of Pain in Cancer, edited by M. J. Schiffrin, Year Book Publishers, Inc., Chicago, 1956, 245 pages, $4.50 (reviewed in this issue, page 402).

Selected Papers of Joseph W. Mountin, M.D., by the Joseph W. Mountin Memorial Committee, 1956, 356 pages. Available through the American Public Health Association, 1790 Broadway, New York, $5.00.

JOURNAL OF GERONTOLOGY

VOLUME 11, NUMBER 4
OCTOBER, 1956

Section B

Psychological and Social Sciences, Social Work and Administration

VOLUME 11, SECTION B OCTOBER, 1956 NUMBER 4

RELATIONSHIPS AMONG WECHSLER, WEIGL, RORSCHACH, EEG FINDINGS, AND ABSTRACT-CONCRETE BEHAVIOR IN A GROUP OF NORMAL AGED SUBJECTS

MARGARET THALER, PH.D.

(From the Department of Clinical and Social Psychology, Walter Reed Army Institute of Research, Washington, D.C.)

Goldstein and others have advanced the concepts of "abstract" and "concrete" attitudes as mental sets shown by individuals in thought processes and demonstrated through behaviors (6). A concrete attitude consists of the simple recognition of an object, event, or sensation, followed by a lack of seeing beyond surface features, realizing other meanings, or backgrounds for the event. There is a rigid attitude toward and lack of voluntary shifting of thought around the event. A perception is binding, only one meaning is considered, and inferences are not made treating the event as an example of a category.

An abstract attitude allows the perceiver to move beyond the sensory impression, to selectively attend to various essential features, and to regard the perception as a sample of a category. These steps are implied (a) recognition, (b) selection of essential features, (c) inferring categoric meanings, (d) moving back and forth freely from abstract to concrete attitudes as the task requires. There are capacities for shifting attention from one aspect to another, for seeing various possible meanings, and for inferring higher order meanings.

Both concrete and abstract behavior are needed and there are tasks which cannot be handled by either attitude alone. Adequate adjustment and concept formation entail combining both attitudes and shifting from one to the other as a situation requires.

Much attention has been given concept formation and abstract-concrete thinking in children, younger adults, and abnormal groups (1, 2, 6, 8, 11, 13, 17). However, concept formation tests have been little used with the aged. Hall (7) and Pinkerton and Kelly (12) studied conceptual impairment in brain damaged presenile and senile dementia cases. Hopkins and Post (9) using 3 of the Goldstein-Scheerer tests reported findings on 49 hospitalized psychiatric patients over age 60. Only 1 patient was able to abstract enough to solve all 3 tests; 9 were able to solve 2 tests; while the rest showed varying degrees of concreteness on all 3 tests. A third of this group had diagnosed cerebral pathology, another third were clinically free from intellectual impairment, and the remainder showed mild memory defects. Recent work by these authors (10) compared these patients with a "normal" aged hospitalized group (arthritics, etc.). Sixty-four per cent of the psychiatric group and 44 per cent of the normal group exhibited concrete performances on the Weigl Color Form Sorting Test. A positive relationship was found between intellectual level and ability to abstract, and only rarely was performance at an abstract level found in persons beyond 68 years on the Weigl test. These studies primarily demonstrated that the Weigl Test did not differentiate between persons with, and persons free of cerebral pathology in this range. Earlier work by Thaler, Frost, and associates (3, 15, 16) reported a high incidence of concrete performance on the Weigl and Rorschach among aged subjects. Concreteness in language and approaches to tasks characterized behavior of both normal and, to a greater extent, senile aged persons. During projective testing it was noted that difficulties arose in getting the correct "set" explained to the elderly subjects. Attempts to "recognize" rather than interpret inkblots, etc., occurred. Directions for other tests seemed to be taken too literally by the aged.

The 3 problems considered on the present study were: (a) the extent of concreteness evidenced by a group of aged subjects, (b) the relationship between concreteness, intellectual level, and certain electroencephalogram find-

Submitted for publication June 25, 1956.

A research grant from the USPHS made possible the original data collection.

The writer wishes to thank Drs. E. W. Busse, A. J. Silverman, and R. H. Barnes, Department of Psychiatry, Duke University School of Medicine, who interpreted the EEG records and supervised the medical evaluation of the patients studied.

Appreciation is also extended to Dr. Laurence Frost, National Institute of Neurological Diseases, Bethesda, Md., for his assistance in the early work on this project; and to Sgt. Jules Van Praag and Dr. Ardie Lubin, WRAIR, for their statistical assistance.

ings, and (c) the relationship between a measure of concreteness and impoverishment of associations on a projective test. The measures used were the Weigl Color Form Sorting Test, a short form of the Wechsler-Bellevue Intelligence Scale, Form I, the Rorschach Test, and clinical EEG findings.

MATERIALS AND METHODS

The subjects were 116 normal volunteers (52 men, 64 women) over age 60. All were living independently in the community. Volunteers were secured from among aged persons attending out-patient services of the Colorado General Hospital for routine check-ups following medical or surgical treatment (i.e., former fracture patients, those securing routine genitourinary examinations, and those seeking treatment for the general infirmities of age). As often as possible, the spouse of a subject was also secured for a testing. Some volunteers from the community at large were tested. All were from middle and lower middle-class socio-economic backgrounds during their working years.

The routine examination of each person included: complete physical and neurologic examinations, medical and social histories, a psychiatric evaluation, a battery of psychologic tests, an electroencephalogram, critical flicker fusion frequency for light, and laboratory tests including urinalysis and blood studies (NPN, serology, blood sugar, CBC, Hb). No person was included in the study if there was a history, or findings of cerebrovascular accident, head injury, epilepsy, senile, arteriosclerotic, or functional psychoses, or detectable neurologic disease.

The social histories revealed that 8 per cent of the group had varying amounts of college education, 26 per cent had some high school training, 52 per cent had 6 to 8 years of schooling, 5 per cent had less than 6 years, and 8 per cent had never attended school.

All of the women (55 per cent of the total group) had been housewives, although a small portion had worked for varying periods during younger years as salesclerks and teachers, and in recent years as baby-sitters. Half the men had been semi-skilled workers. Of the remaining men, approximately one-half had been unskilled and one-half skilled workers. Almost all were living on pensions.

The subjects ranged in age from 60 to 101 years, with a mean age of 73.04 years, and a SD of 7.53 years.

The Weigl Test: The subject is presented with 12 unarranged, flat plastic figures: 4 each of equilateral triangles, squares, and circles. Each of these forms occurs once in red, blue, green, and yellow. The subject is asked to sort the figures which he thinks belong together. The expected response is a grouping either by color or form. Following the first grouping the figures are disarranged and the subject is asked to re-sort them in another way (e.g., if the first sorting was by form, the subject would then sort on the basis of color).

The normal adult below 60 years of age reported in the literature is usually able to abstract the two basic similarities (form and color) and to sort accordingly (1, 2, 8, 11, 13, 17). The abnormal individual tends to use a concrete approach to the task. He may arrange the figures in patterns even though the basic grouping is correct; he may be unable to shift from one concept (form or color) to the other; he may fail to make an original abstraction, or to learn one or both sortings from the examiner (1, 6, 7, 9, 10, 12).

In this study performance was scored according to the following modification of the Goldstein and Scheerer's criteria (6). A 5 point descriptive scale was established during earlier research with this test to avoid the usual dichotomized scoring of performance as either abstract or concrete (3, 15, 16). The new scoring helped to explore patterning and language aspects of sorting. The ratings were as follows:

1. The subject made the two sortings quickly, gave an adequate verbalization of what he had done, and showed no need to build a pattern with the pieces.

2. The subject made the two sortings correctly, verbalized adequately, but tended to build patterns with the pieces (mild tendency to concreteness in treating the objects, but language skill was adequate).

3. The subject correctly sorted the pieces, and may or may not have patterned them, but could not verbalize that color and form were the conceptual sorting principles. Adequate verbal accounting could not be made for the groupings.

4. One sorting with or without patterning was made, but the subject could not voluntarily shift to the other grouping. The examiner then attempted to teach the subject the shift as a test of learning capacity in this situation, and success ensued.

5. The subject could not make a sorting by either color or form and could not learn the sortings from the examiner. He was unable to abstract any common feature and was unable to learn the features and groupings when shown.

EEG: Each record was independently rated by 3 electroencephalographers according to the Gibbs classification of EEG tracings (4). Any record not unanimously classed by all 3 was presented to each rater for re-evaluation with the varying ratings anonymously noted with the request to classify the record in light of these possible ratings.

Short Form Wechsler Test: The vocabulary, information, block design, and digit symbol tests of the Wechsler-Bellevue Intelligence Scale, Form I, were used. These represent performances reportedly most resistant (information and vocabulary) and most prone to deterioration in the elderly, so that the expected "best" and "poorest" aspects of performance on this test might be measured (5, 18).

No particular order was followed, the main criterion being the presentation of tests in such a manner as to be as comfortable for the subject as possible. These individuals seemed to put forth best efforts on the tests. All had volunteered and their attitudes were ones of interest and helpfulness toward the project.

RESULTS

1. Markedly concrete approaches to the sorting task were used by 66 per cent of this group.

2. A significant relationship was found between better performance on the Wechsler subtests and more abstract performance on the Weigl Test, $p. < .001$.

3. Greater associative impoverishment on the Rorschach and more concrete levels of performance on the Weigl tended to occur together, $p. < .01$.

4. Increased age paralleled decreased performance on the Wechsler subtests used, $p. < .001$.

5. Advancing age did not seem to correlate with any particular EEG classification, even though 62 per cent of the records were deemed abnormal. Those persons with normal and focal records tended to attain higher total weighted scores on the Wechsler than did those with mixed and diffuse records, $p. < .01$.

Table 1 summarizes the relationships between the variables studied. Age and the sum of the weighted scores on the 4 Wechsler subtests correlated negatively ($-.366$, $p. < .001$) with the older subjects tending to obtain lower weighted scores.

TABLE 1. SUMMARY OF RELATIONSHIPS BETWEEN VARIABLES.

	Wechsler	EEG	Rorschach	Weigl
Age	.001	NS	—	NS
Weigl	.001	NS	.01	—
EEG	.01	—	—	—

There was a significant relationship ($p. < .001$) between better performance on the Weigl and higher total weighted Wechsler scores, and also between the Weigl and each of the 4 Wechsler subtest scores taken individually. There was a strong tendency ($p. < .001$) for higher verbal scores to accompany higher Weigl scores.

Those persons with normal and focal EEG tracings tended at the .01 level of confidence to attain higher total Wechsler scores than those persons with diffuse and mixed EEG patterns.

There was a high incidence of concrete performance on the Weigl (66 per cent of the subjects scoring at concrete levels), and of pathology noted in the EEG records (62 per cent were rated abnormal in some respect).

Analysis of the variance in the distributions from which table 2 was derived revealed no significant relationship between the age distribution and the type of EEG classification. Also there was only a chance relationship between sex and type of record.

The feature of note was the significantly high number of tracings classed as abnormal in this group of aged subjects. A control series of EEG's from the same laboratory on 329 normal adults aged 18 through 54 years contained 86.1 per cent normal records, 13.9 per cent diffuse records, and no focal or mixed records (15).

TABLE 2. MEAN AGE FOR EACH EEG CLASSIFICATION.

	Normal	Focal	Diffuse	Mixed	Total
N	44	27	27	18	116
Mean Age	72.46	71.63	74.78	73.95	73.04
SD	6.54	6.19	9.74	7.79	7.53

Thus there was evidence of considerable pathology in the records of these aged subjects, but particular pathologies did not directly correlate with increasing age.

EEG and Wechsler Scores.—Those persons whose EEG records were in the normal and focal groups tended to perform better on the Wechsler subtests. Table 3 shows the means and standard deviations for a total score, made by combining the 4 weighted Wechsler-Bellevue subtest scores for each of the EEG groups.

Analysis of the variance among the total weighted Wechsler-Bellevue scores for each EEG classification and the use of t-tests revealed that the group with normal EEG's tended to obtain higher Wechsler scores ($p. < .01$) than those with mixed or diffuse records. Those with focal records tended to attain higher Wechsler scores than those with diffuse ($p. < .01$) and mixed ($p. < .05$) tracings. There was no significant difference between the averages of the normal and focal groups and no significant differences between the averages of the mixed and diffuse groups. In essence, normal and focal records tended to occur together with higher Wechsler scores more often than did mixed and diffuse records.

The trend in clinical usage and in the literature is to correlate the final obtained IQ with EEG and other criteria, even in aged groups, without giving due consideration to the amount of score that accrues from the Wechsler method of "correcting for the age factor." To illustrate this, comparisons were made between the "corrected IQ" where a corrective factor for age was added to each individual's score upon the basis of his age and the EEG. A relationship not quite significant at the .05 level was obtained, whereas the relationship between the actual total weighted score and the EEG was at the .01 level of confidence. For example, a man aged 101 with a total weighted score of 12 points obtained a final IQ of 87, but a man of 65 years with a total weighted score of 11 points obtained an IQ of 72. Thus it seems that the score prior to adding the Wechsler age correction is the better choice in studies such as this.

EEG and Weigl.—The obtained chi-square values for table 4 revealed only a chance relationship between an individual's EEG classification and his performance on the Weigl test.

TABLE 3. TOTAL COMBINED SCORE ON FOUR W-B SUBTESTS FOR EACH EEG CLASSIFICATION

	Normal	Focal	Diffuse	Mixed
N	44	27	27	18
Mean Total Score	28.84	27.74	22.33	23.67
SD	9.39	10.66	12.04	12.32

TABLE 4. WEIGL SCORES FOR EACH EEG GROUPING.

Weigl Score	EEG Classification					
	Normal	Focal	Mixed	Diffuse	Total	Percentage
1	2	4	1	2	9	8
2	8	4	4	4	20	17
3	5	4	1	0	10	9
4	17	8	3	13	41	35
5	12	7	9	8	36	31
N:	44	27	18	27	116	—

$df = 12$
$\chi^2 = 12.955$
$p = .45$

Table 5 indicates the marked degree of concreteness in the performance of these elderly subjects. Only 8 per cent were able to score at the unqualifiedly abstract level. All the remainder showed some degree of concrete behavior. Seventeen per cent patterned the pieces, and 9 per cent grouped correctly but could not verbalize the concepts used. Thus 34 per cent were able to make both sortings. The remaining 66 per cent could not. Those scoring at level 4 made one sorting but could not voluntarily shift to the other. As a mere point of interest here, of those 80 per cent who were able to make at least one sorting, 70 per cent (57) grouped first by form.

TABLE 5. LEVELS OF SUCCESS ON THE WEIGL COMPARED WITH MEAN AGE, IQ AND EQ.

Weigl	Number	Percentage	Age		W-B IQ		EQ	
			Mean	s	Mean	s	Mean	s
1	9	8	71.44	3.00	105.89	7.74	88.67	8.50
2	20	17	72.75	7.12	104.25	8.14	86.00	9.95
3	10	9	74.00	5.10	101.50	13.13	81.00	15.30
4	41	35	71.63	8.65	101.37	8.34	75.05	10.93
5	36	31	75.06	7.10	81.44	13.22	59.36	14.41

N = 116.

*Efficiency Quotients.**—To further explore the foregoing findings, efficiency quotients were obtained for each subject from his Wechsler score. The IQ's ranged from low to high average. The EQ's were approximately 20 points below the corrected IQ's and suggested that these aged persons, when compared with Wechsler's 20 to 24 year old group standard, would seem to range in functioning level from high grade deficiency to the upper range of dull normal. It might be inferred that EQ's of at least 80 and upward may be necessary to enable elderly subjects to form the necessary concepts on the Weigl.

Associative Impoverishment. — Comparisons were made between each person's Weigl level and what we choose to call "associative impoverishment" signs on his Rorschach.

The presence in a record of any 5 or more of Piotrowski's signs (14) was considered sufficient to meet the criterion of associative impoverishment.

Table 6 reveals that the percentage of subjects with impoverishment signs increased as concreteness on the Weigl became more marked. A chi square comparison of the incidence of occurrence of impoverishment signs in Weigl groups 1-4 versus level 5 was 9.94 ($p. < .01$). Thus a type of associative impoverishment paralleled concrete performance on a sorting tasks in these subjects.

TABLE 6. WEIGL LEVELS AND RORSCHACH IMPOVERISHMENT SIGNS.

Weigl Level	Percentage of Persons with 5 or More Signs
1	0
2	12
3	22
4	26
5	46

DISCUSSION

These aged persons were living independently in the community, had been classed as nominally normal older persons, deemed by examining physicians to be free of demonstrable cerebral defect, senile, arteriosclerotic, or functional psychoses. Educational level was somewhat above average national expectancies for the age range. Yet extensive concreteness was found among this aged group on a simple sorting test. Thirty-one per cent could not make one sorting alone and could not learn the sortings from the examiner when shown. The limitation of capacity seemed remarkable. For example, Korstvedt (11), working with 15 to 18 year old normal, moron, and borderline subjects found that both groups of subnormals in this young age range could learn the two sortings from the examiner. Others (8, 13) report young children around 8 years of age are able to solve the Weigl sortings.

During the testing of the subjects reported here, it was noted that the sheer comprehension of the task was amazingly difficult for the persons who scored at levels 4 and 5 on the Weigl. These same persons often were able to appear alert, talkative, and responsive when they initiated conversation on topics they spontaneously brought up. The contrast was between their seeming verbal productivity and charm when they initiated topics and recalled past events in their lives, and the difficulty they had in trying to perform examiner-initiated tasks wherein they had to form a concept around a topic given them, such as the Weigl presents.

The performance of these subjects suggested that those who functioned at concrete levels on the tests might also be concrete in other ways. They may try to adjust by sheer attempts to recognize aspects of their environment and be unable to form inferences and conceptually interpret what is going on around them. They may be literal in comprehending what is said to them, and in their humor and jokes. These aged persons may feel there is only one meaning to a situation, may fail to see other meanings, and hence to have the "rigidity" so often attributed to the elderly.

While much has been done with various groups to measure concrete or abstract "set" toward sorting tasks, the experience in this study suggested that "capacity" may be a more pertinent concept in the aged. Even with considerable assistance, nearly a third of these subjects could not perform this simple task.

SUMMARY

The present study investigated relationships between varying levels of abstract-concrete performance on the Weigl Color Form Sorting Test, IQ as measured by the Wechsler-Bellevue Scale, the degree of associative impoverishment

* An intelligence quotient on the Wechsler measures a person's ability relative to individuals of his own age group. In the efficiency quotient, the subject's test score is compared to a fixed standard, the indices given for the age group 20-24 years. Wechsler considers this the "maximal age" at which education is complete for most adults, and after which intelligence test scores begin to fall off for most individuals. (18, p. 221).

noted on the Rorschach, and clinical EEG findings in a group of 116 individuals over 60 years of age living independently in the community and believed to be free of cerebral defect, senile, arteriosclerotic, or functional psychoses.

The following results were obtained:

1. A significant relationship was found between better performance on the Wechsler subtests and more abstract performance on the Weigl Sorting Test, $p. < .001$.

2. Greater associative impoverishment on the Rorschach and more concrete levels of performance on the Weigl occurred together, $p. < .01$.

3. Markedly concrete approaches to the sorting task were used by 66 per cent of this group. This was considered suggestive of limited capacity in this group to perform at an abstract level on the test used.

4. Advancing age did not appear to correlate with any particular EEG classification, even though 62 per cent of the records were deemed abnormal. Those with normal and focal records tended to attain higher total weighted scores on the Wechsler than did those with mixed and diffuse records, $p. < .01$.

5. Increased age paralleled decreased performance on the Wechsler subtests used, $p. < .001$.

REFERENCES

1. Bolles, M. M.: The Basis of Pertinance; a Study of the Test Performance of Aments, Dements, and Normal Children of the Same Mental Age. *Arch. Psychol., No.* 212, 1937.
2. Colby, M. G., and Robertson, J. B.: Genetic Studies in Abstraction. *J. Comp. Psychol.*, 33: 385-401, 1942.
3. Frost, L. L.: *A Psychological Investigation of the Aged: Intelligence, Personality, Concept Formation, Psychomotor Speed.* Unpublished dissertation, Univ. of Denver, 1952.
4. Gibbs, F. A., and Gibbs, E. L.: *Atlas of Electroencephalography, Vol. I.* Addison Wesley Press, Cambridge, 1950.
5. Goldfarb, W.: An Investigation of Reaction Time in Older Adults. *Teach. Coll. Contrib. Educ.*, No. 831, 1941.
6. Goldstein, K., and Sheerer, M.: Abstract and Concrete Behavior: An Experimental Study with Special Tests. *Psychol. Monogr.*, 53, 1941.
7. Hall, K. R. L.: Conceptual Impairment in Depressive and Organic Patients of the Pre-senile Age Group. *J. Ment. Sci.*, 98, 256-264, 1952.
8. Heald, J. E., and Marzoff, S. S.: Abstract Behavior in Elementary School Children as Measured by the Goldstein-Sheerer Stick Test and the Weigl Color Form Sorting Test. *J. Clin. Psychol.*, 9, 59-64, 1955.
9. Hopkins, B., and Post, F.: Abstract and Concrete Behavior in Elderly Patients (Abstract). *J. Geront.*, 6, supp. to No. 3, 104, 1951.
10. Hopkins, B., and Post, F.: The Significance of Abstract and Concrete Behavior in Elderly Psychiatric Patients and Control Subjects. *J. Ment. Sci., 101*, 841-850, 1955.
11. Korstvedt, A., Stacey, C. L., and Reynolds, W. F.: Concept Formation of Normal and Subnormal Adolescents on a Modification of the Weigl-Goldstein-Sheerer Color Form Sorting Test. *J. Clin. Psychol., 10*, 88-90, 1954.
12. Pinkerton, P., and Kelly, J.: An Attempted Correlation between Clinical and Psychometric Findings in Senile Arteriosclerotic Dementia. *J. Ment. Sci., 98*, 244-255, 1952.
13. Perugia, A.: Contributions to the Study of the Evolutional Process of Intelligence. *Publ. Univ. Cattolica Sacro Cuore*, 35, 167-243, 1950.
14. Piotrowski, Z.: On the Rorschach Method and Its Application in Organic Disturbances of the Central Nervous System. *Rorschach Res. Exch., 1*, 65-77, 1936-37.
15. Silverman, A., Busse, E., Barnes, R., Frost, L., and Thaler, M.: Physiological Influence on Psychic Functioning in Elderly People. *Geriatrics*, 8, 370-376, 1953.
16. Thaler, M., and Frost, L. L.: Physiological and Psychological Correlates of Aging. *Am. Psychol.* 8, 446, 1953.
17. Vinacke, W. E.: The Investigation of Concept Formation. *Psychol. Bull., 48*, 1-31, 1951.
18. Wechsler, D.: *The Measurement of Adult Intelligence* (3rd ed.) Williams and Wilkins, Baltimore, 1948.

AN ATTEMPT TO USE PRODUCTION DATA IN THE STUDY OF AGE AND PERFORMANCE

H. F. KING, M.A., M.Sc.

(From the Nuffield Research Unit into Problems of Ageing, Psychology Laboratory, Cambridge, England)

At various times consideration has been given to the possibility of using production data in the study of age differences, but a number of difficulties have arisen in either the collection of records or in the analysis and interpretation of results.

First, the proportion of older people on production work is substantially lower than the proportion of younger people (2). Since a study of age differences demands the existence of a fair number of individuals engaged on strictly comparable work, many operations are ruled out because there are not enough people in the higher age groups. In other cases, the records of earnings, output, or wastage are not in a form which can be used to give reliable measures. Where these difficulties can be overcome it is still necessary to allow for the influence of upward or downward selection of employees.

After these qualifications have been taken into account, two general types of study are possible. A short-term sample can be taken and the production of the individuals falling in one age group compared with that of persons in other groups. Alternatively, the records of individuals can be followed over a number of years, making comparison of their output at intervals of time to see whether any consistent changes are to be found. This can be done either by going back over past records—if such can be found for a sufficiently long period, which is extremely rare—or by waiting for enough time to elapse after the beginning of the study, a procedure which presents obvious difficulties for the researcher. Furthermore, labor turnover during the period of observation considerably reduces the number of survivors from the ranks of the original population.

Notwithstanding the difficulties, a number of investigators have used production data, and Wackwitz (6), who himself carried out a large-scale study in a Dutch electrical factory, has summarized many of their findings. His own results provide what seems to be the best example of this work. He compared the production of individuals in different age groups up to retiring age for several sets of workers representing different grades of skill, using periods ranging from a few weeks to a year. His measures of hourly earnings, at piece or bonus rates, show a rise in production to the thirties, at some point in which age group comes the maximum, followed by a slow decline. He went on to calculate yearly rates of increment up to the maximum and of the subsequent decrement as age increased.

In looking at these results, it is necessary to bear in mind that any major fall in level of production, especially a fall occurring over a short period of time, is not likely to be tolerated for long by management, even if the worker himself does not seek other employment. Evidence collected by Belbin (1) and Richardson (5) suggests that a substantial drop in production is in fact rarely seen among the older workers on a job, who seem to maintain performance, even if doing so means working under an increasing strain until they leave the job altogether. This factor alone limits the range of variation and the possible deterioration of performance among the older people on an operation. Furthermore, the important question arises of how far workers who remain after some years during which labor turnover has been going on are representative of their age group, or whether they are in some significant sense a selected group. The present study gives some indications that selection of this type does occur, influencing the observed levels of performance.

SOURCE OF DATA

The factory from which the data used here were obtained (by Dr. R. M. Belbin) was concerned with the manufacture of underwear and all the work was carried out by women using power sewing machines. Several departments

Submitted for publication February 17, 1956.
The author wishes to express his appreciation of the courtesy, cooperation, and considerable effort of the Holt Hosiery Co. Ltd., Bolton, England, in the collection of the data. Dr. R. M. Belbin carried out a good deal of the early work on records and was responsible for the original contact with the company. Mr. A. T. Welford, the Honorary Director of the Nuffield Research Unit, was generous in the giving of time for very helpful discussion of the paper.

were involved, each dealing with a particular type of underwear needing different methods of stitching. These were known as overlocking (two departments used this stitch, but for different purposes), flatlocking, welting, elasticating, and plain sewing. Also concerned was a vest section in which various workers were doing flatlocking, welting, and plain sewing. This section was not set up until March, 1950, but its personnel was initially drawn from experienced workers on the appropriate kinds of stitching in the other departments.

The production records received by the author were not continuous, but it was possible to work out production scores for 8-week periods in the autumns of 1949, 1950, and 1952 (but, unfortunately, not in 1951), and one of the same length for the early months of 1953. All the kinds of work done in the sewing departments and all the parts of garments worked upon had a place in the production points system, which was so arranged that the persons carrying out the more difficult tasks at any time were compensated for the reduction of output. Each worker was paid according to the total number of points she had gained during the week. Records were also kept of the number of hours each woman worked, and from the two sets of data an hourly points average was calculated for the 8-week period under study.

Among the employees at any given period there were some recent recruits, and it was necessary to exclude from each period all persons not having completed the length of time considered necessary for new entrants to reach what was termed the "experienced workers' speed." The time taken to learn the skill and acquire the "standard speed" varied from 7 - 9 weeks for welting to 10-12 weeks for flatlocking, which took longest, and twice as long was required to reach the experienced workers' speed, a rate of $1\frac{1}{3}$ times the standard. The best age for learning was considered to be 15, and then ages up to 18, above which trainability was said to decrease, although women who had carried out the work previous to several years' absence were quite frequently taken on. An experimental scheme for training women over 40 without previous experience in the work, making large allowances for their difficulties, was nevertheless unsuccessful, only 1 out of 9 trainees eventually entering an ordinary department.

In a few cases the temporary shortage of work, the breakdown of the machine, the provision of tasks paid for at time rates, or absence through illness, made it essential to leave out the individuals concerned from the particular period in question. The final numbers of individuals whose records were usable and their age distribution are shown in table 1.

TABLE 1. AGE DISTRIBUTION OF WORKERS PROVIDING PRODUCTION DATA.

Year	Age Groups						
	15–17	18–20	21–25	26–30	31–40	41–60	Total
1949.....	12	26	10	12	13	9	82
1950.....	16	18	13	12	14	12	85
1952.....	12	12	15	10	10	9	68
1953.....	6	13	14	7	9	10	59

Of the personnel concerned in the sewing departments at the outset of the study, 34 remained at the end, and 6 of these had, for one or other of the reasons mentioned above, a gap in the set of 4 periods. The remaining members of the departments changed fairly frequently, there being altogether 32 women who only stayed long enough to be included in one period. In spite of this considerable labor turnover, and notwithstanding fluctuations in the factory's output, due to changes in demand, the over-all figures for performance in relation to age show the same trends from one period to another (see fig. 1). The picture also has

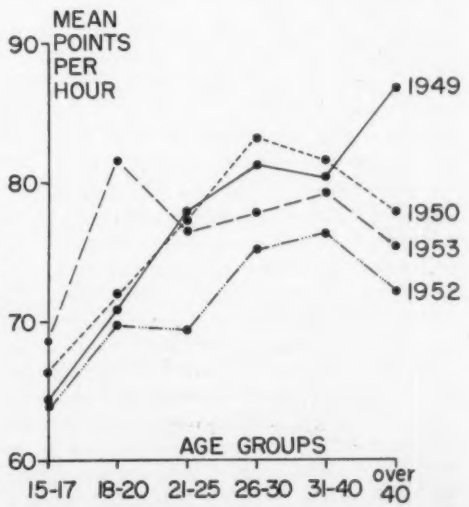


Fig. 1. Age and productivity levels of four 8-week periods.

TABLE 2. RESULTS OF RANK CORRELATIONS BETWEEN SCORES OF INDIVIDUALS IN DIFFERENT AGE GROUPS.

Year	Normal Deviate and P.	Groups Compared			
		15–17 and 26–30	15–17 and 31–40	15–17 and 41 and Over	18–20 and 26–30
1949	N.D.	3.086	2.962	3.482	2.141
	P.	<.003	<.005	<.001	<.04
1950	N.D.	3.108	2.638	2.158	2.729
	P.	<.002	<.009	<.04	<.007
1952	N.D.	2.338	2.668	2.130	1.419
	P.	<.02	<.008	<.04	>.1
1953	N.D.	1.495	2.159	1.245	0.517
	P.	>.1	<.04	>.1	>.1

strong resemblance to that observed by Wackwitz, although the peak level of performance occurs at a slightly earlier age.

At ages above 35, the mean level of performance tends to decline, that of the women aged over 50 being lower than that for the women in the 41-50 group, although some of their individual scores were well above the average for young performers. Furthermore, the performance of those over 40 was superior to that of the teen-age groups, with the single exception of the 18-20 group during the 1953 period.

The tau rank correlation method was used for assessing the significance of the differences between age groups, and the values obtained are shown in table 2 for those comparisons yielding more than 1 significant result from the 4 periods. In all these cases the older of the 2 groups gave the better performance. The only other significant differences were in the same direction, and were those between the 18-20 group and the 41 and over group in 1949 (normal deviate 2.649, $P < .009$) and between the 18-20 and 31-40 groups in 1950 (N.D. 2.183, $P < .03$).

The scores of the 26-30 group and that of the 31-40 group are not significantly different for any period, and the tendency for the 41 and over group to have lower scores than either of these also does not reach the level of significance, so that much weight must not be placed on this part of the production curve unless supported by other evidence.

The difference between the mean of the 4 means for the youngest group and that for the 26-30 group is equivalent to an increase in productivity of about 1.4 per cent of the maximum figure for each year of age. The corresponding rate of decrease cannot be easily estimated because of the small numbers of subjects when the 41-60 group is subdivided, but is certainly much lower. Most of the groups of workers for whom Wackwitz tabulated figures had yearly increments in the range 0.5 - 2.0 per cent and decrements in the range 0.5 - 1.0 per cent. The question remains as to whether the shape of the production curve is influenced by the elimination of inferior performers over the years. Some evaluation of the results regarding this point can be obtained by considering the changes in the performance of individuals over the course of the years studied and also the relative performance of stayers and leavers.

CHANGES IN PERFORMANCE

The measure of change taken was simply the number of points per hour gained or lost from the first period to the second. Because of the fluctuations in the general level of performance, the best method of testing the relation between age and change was judged to be that of ranking all individuals having usable scores for each of the possible comparisons, of which there are 6 in all, placing them in order from the one with the greatest increment to the person with the greatest decrement. The tau method was used, and the results are given in table 3 for

TABLE 3. AGE AND CHANGES IN PERFORMANCE.

Years Compared	All Persons			Aged 30 or Under			Aged Over 30		
	No.	Normal Deviate	P.	No.	N. D.	P.	No.	N. D.	P.
1949–1950	58	1.575	>.1	39	1.119	>.1	19	0.598	>.1
1949–1952	36	3.006	<.003	27	2.315	<.03	9	0.526	>.1
1949–1953	31	3.177	<.002	22	2.497	<.02	9	0.208	>.1
1950–1952	42	2.056	<.04	29	2.049	<.05	13	1.052	>.1
1950–1953	40	3.232	<.002	27	2.540	<.02	13	0.698	>.1
1952–1953	56	4.170	<.001	38	2.578	<.01	18	0.648	>.1

all persons and separately for those aged 30 or under and those over 30 in the first-named year.

In all cases, with the exception of the 1949-1950 comparisons, the trend from increase in points per hour at the young end of the age scale through little or no change to decrease in score among the higher ages was significant. In particular, it is interesting to note that the over-all comparisons involving 1949 as the first period show an increasing strength of trend as the length of time between the periods becomes greater. When the individuals ranked in the 1949-1953 group are examined for the two shorter periods, the results are as follows:

1949—1950: Normal Deviate = 1.144, $P > .1$
1949—1952: Normal Deviate = 2.338, $P < .02$

The direction of change remains the same, and the second result is again significant, although we are dealing with a group which has had no gains or losses of personnel over the years studied.

The over-all results obtained from studying changes of performance are attributable primarily to the improvement in younger women's scores, since ranking of the changes for those aged 30 or under gives significant results for all comparisons except 1949-1950, whereas none of the results for those over 30 separately reach significance. Within the 30 or under age group, the girls not yet 21 are the largest contributors to the observed results.

The improvement of the younger employees relative to the older ones is also shown in table 4, where the mean scores are given for the 10 women aged over 30 in 1949, and the 21 aged 30 or under, for whom there are complete sets of records.

One further point of interest in the changes of performance concerns the comparison of scores for 1952 and 1953. At first sight it is

TABLE 4. SCORES OF WORKERS STAYING FROM 1949 TO 1953.

Category	Mean Points per Hour Score			
	1949	1950	1952	1953
10 workers aged over 30 in 1949 (mean age 44.8)	85.4	85.8	75.6	77.5
21 workers aged 30 or under in 1949 (mean age 20.7)	74.4	77.3	72.1	78.1
Score of older groups minus score of younger group	11.0	8.5	3.5	−0.6

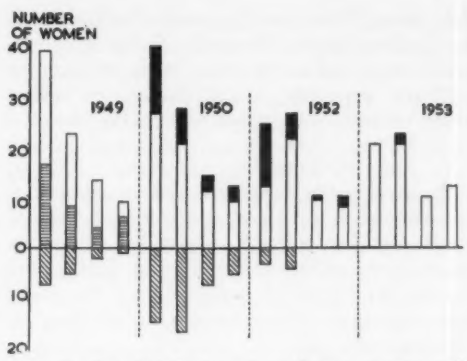


Fig. 2. Age distribution of employees, starters and leavers.

Key: Above base line, women employed at date shown. The black portions indicate newcomers since the previous period. The horizontally shaded portions in 1949 indicate women still employed in March, 1953.

Below base line, those women at present employed who had left before the next period began.

Age groups: 15-20; 21-30; 31-40; over 40.

surprising that such a high level of significance should be obtained, in view of the short interval of time between the two periods, but, as is seen by reference to figure 1, there was a substantial rise in the general level of output, the rise being particularly marked in those under 25. It may perhaps have been that the older employees were working nearer their optimum rate in the earlier period and had less scope than the young ones for expansion of output when this was required. Such an explanation would link with the suggestion, mentioned earlier, regarding the maintenance of performance up to the time of leaving by older workers, since persons under some strain in keeping up their present output would have more difficulty in responding to a need for higher performance.

PERFORMANCE ON SEPARATE TASKS

When the total number of employees is divided into those engaged in each kind of stitching, the small numbers so obtained restrict the amount of investigation which can be carried out at this level. However, it does seem that the over-all picture is reflected, not contradicted, in the results for separate tasks, even in these groups. For overlocking and flatlocking, which together account for two-thirds of the personnel, there are sufficient people for ranking of individual changes to be practicable. These reach the level of significance in 2 of the 12 comparisons, but 9 of the others show the same direction of change, the younger women tending to improve, the older ones tending to

lose points; the remaining comparison revealed no tendency in any direction. So far as can be seen, then, the examination of separate tasks indicates that similar age changes are taking place for each of the kinds of stitching used.

STAYERS AND LEAVERS

It has already been said that there was a considerable inward and outward movement of employees during the 3½ years, but it remains to show the relation of this to age and its influence on figures of performance. The main data regarding the turnover are illustrated in figure 2.*

It will be seen that the 15-20 and 21-30 age groups predominate, not only in the numbers of women employed at any one time, but also among the incoming and outgoing personnel. The juveniles provide the bulk of the entrants, as is to be expected, but the 21-30 group shows the largest losses, both in terms of actual numbers and in relation to the numbers employed. Leaving on account of marriage and child-bearing are common reasons, and the high rate of loss in the twenties is attributable to these factors.

The personnel in the younger groups undergoes a good deal of change, but there remain a certain number who continued at the job all the way through, and of the 60 employees aged 30 or under in September, 1949, 24 (40 per cent) were still there in March, 1953. This compared with 10 out of 22 (45.5 per cent) for those aged over 30 in September, 1949. It is the remaining part of the population where changes occur with much greater frequency among the young people than among the older ones.

That the form of the age and production curve could not be entirely due to the removal of persons with poor scores was inferred earlier. As is seen from figure 3, however, the scores for leavers before the next period have a lower mean than those for persons staying at least until the next period. That is true for each of the three years in which such a division is possible and holds for women aged 15-20 and for those over 20, although the gap between stayers and leavers is wider for the younger group. The

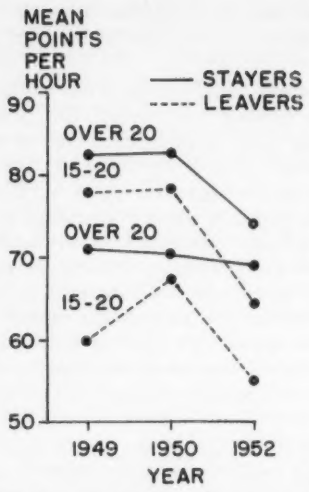


Fig. 3. Performance levels of all stayers and leavers. Key: Stayers are those remaining at least until the next period. Leavers are those who left before the next period.

differences do not reach the level of significance, using the tau rank correlation method on individual scores, because of the considerable overlap of performances. Separation of the over 20 group into those aged 21-30 and those over 30 gives figures closely similar to those for the amalgamated group, although the number of leavers in the oldest group is small.

An over-all comparison of stayers' and leavers' scores takes no account of the possibility that, although persons in the training stages are excluded, the group of leavers may contain a high proportion of women with short experience, whose scores are consequently low. This factor could perhaps account for the whole of the observed difference between the scores of stayers and leavers. To check the point, leavers were paired with stayers of equivalent age and experience,* in the first instance stayers on work requiring the same stitching method being used. Where leavers could not be paired with stayers using the same stitch, comparison was attempted with women in other departments. This increased the total number of pairings for the three periods from 25 to 37, and the differences between the leavers paired by the two methods were negligible.

There remained 19 leavers whose age and experience could not be matched, and this

* The totals of individuals for the various periods are higher in figure 2 than in the section on production data because of the existence in the latter case of a few records not completely usable. In addition to the 15 leavers between the 1949 and 1950 periods, one girl, aged 24, was promoted, and another, aged 26, was transferred to other work. The former was an above average performer, the second below average. The only other similar occurrence was the transfer of a woman, aged 30, of average performance, between the 1952-1953 periods.

* The pairing limits were as follows: Age: under 21, maximum difference in age 1 year; 21-30, 2 years; 31 and over, 5 years. Experience: under 1 year's experience, maximum difference 3 months; 1-5 years' experience, 6 months; more than 5 years' experience, 1 year.

group was significantly older than the matched group: by the tau method, ranking individual ages, Normal Deviate = 2.044, $P < .05$. Detailed examination showed that this difference was due to a number of people in the 21-30 age group who could not be matched because details of their experience were incomplete. The remainder of the unmatched group did not differ in age or experience from the paired leavers, and there was no significant difference between scores for those with known or unknown experience, separately or combined, when ranked with paired leavers. It may be concluded that the paired group was not a selected sample of the leavers, at least so far as level of performance was concerned.

The paired leavers returned lower mean scores for each of the three periods separately than did the stayers matched with them (fig. 4). When separate age groups were examined it was seen that the difference was greatest in the 15-20 group, whereas in the group of those over 30 there was hardly any difference. The difference between the stayers and leavers was significant only in the youngest group, using the tau rank correlation method on individual scores (Normal Deviate = 2.466, $P < .02$). Among this group the stayers' score was higher than the leavers' in 14 of the 18 pairs, against 9 out of 13 for the 21-30 group, and 3 out of 6 for those over 30. It may be concluded that the elimination of poor performers occurred predominantly in the lowest age group, becoming of much less importance after the age of 20.

DISCUSSION

A poor standard of performance is, it seems, only one among several numerically important reasons for leaving, but it is of particular weight among the teen-age employees. In this age group losses are well above average among the poorer performers, and those who stay on constitute a superior sample, although retaining some workers not of high standard. The selection at these ages has an effect on the older groups, where there are few newcomers, and even fewer without any previous experience in the work, and therefore few chances of introducing low-level producers, since existing employees reaching the higher age groups tend not to include the poor performers among the original starters. The losses due to transfer or promotion were in this study negligible, only 3 cases occurring, no especial range of performance being involved.

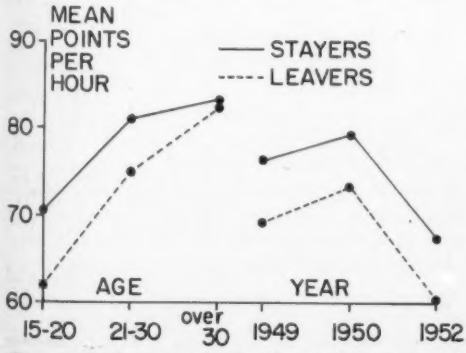


Fig. 4. Performance levels of paired stayers and leavers.

The observations on the production of stayers and leavers indicate that some part of the rise in productivity up to about the age of 30 may be attributed to selective processes, but our other evidence, particularly that on individual changes of performance, shows that this cannot be the complete explanation. There are also operating what may be broadly termed age changes, in which factors of general experience, attitude, and temperament may be important, as well as those concerned with the development of skill at the task.

A slow decline with increasing age seems to follow the attainment of peak output, but the rate is less than the earlier rate of increment. The available evidence is not sufficient to indicate what factors are of importance in this decline, but it seems reasonable to suppose that they are the same as those which influence performance on sensorimotor tasks in the laboratory (7). In the latter context an important locus of change seems to lie within the central nervous mechanism concerned with the organization of incoming data and their translation into action.

The fact that the decline is slow would seem from the present results clearly not to be due to the poorer performers leaving in the higher age groups. A more positive statement would involve going beyond the evidence, but three possibilities deserve consideration: 1) Laboratory studies (4, 7) suggest that age changes in sensorimotor capacity affect maintenance of a skill already acquired less than they affect the ability to deal with new tasks; 2) People may leave in anticipation of any substantial fall of performance, as is suggested by Richardson's (5) work; 3) The maintenance of performance

may result from selection during the early years coupled with the fact indicated by a number of studies, such as that of Foulds and Raven (3), that superior performers retain their capacities into middle and old age better than do those of lower initial ability.

SUMMARY

The production of some women sewing machinists was studied for four 8-week periods between 1949 and 1953. Peak of production was reached around the age of 30, and at ages above 35 a slow decline was observed. Poor performance was only one among several important reasons for leaving, but was of particular weight among teen-agers, and consequently exerted some influence on the general standard of higher age groups.

REFERENCES

1. Belbin, R. M.: *A Study in the Employment of Older People.* Ph.D. Thesis, Cambridge University, 1952.
2. Belbin, R. M.: Difficulties of Older People in Industry. *Occup. Psychol., 27:* 177-190, 1953.
3. Foulds, G. A., and Raven, J. C.: Normal Changes in the Mental Abilities of Adults as Age Advances. *J. Ment. Sci., 94:* 133-142, 1948.
4. Kay, H.: The Effects of Position in a Display upon Problem Solving. *Quart. J. Exper. Psychol., 6:* 155-169, 1954.
5. Richardson, I. M.: Age and Work; a Study of 489 Men in Heavy Industry. *Brit. J. Indust. Med., 10:* 269-284, 1953.
6. Wackwitz, J. D.: *Het Verband Tusschen Arbeidsprestatie en Leeftijd.* Waltman, Delft, 1946.
7. Welford, A. T.: *Skill and Age.* Oxford University Press, London, 1950.

A STUDY OF PERFORMANCE IN RELATION TO AGE AT TWO PRINTING WORKS

HILARY M. CLAY, M.A.

(From the Nuffield Research Unit into Problems of Ageing, Psychological Laboratory, Cambridge, England.)

It is a commonly-held opinion that whereas semi-skilled repetitive work often becomes increasingly difficult as a man or woman reaches middle-age, high-grade skills may continue unimpaired until normal retirement age or beyond. This opinion is probably substantially correct, but the evidence for it is scanty. At first sight a suitable method of studying age changes, as they affect industrial work, would be to study production records and take lower figures among older people as a sign of failing capacity. The difficulty about this method is that neither employee nor management would be likely to tolerate any substantial drop in productivity for long, and thus low production figures would not appear because people unable to maintain a reasonable output would almost certainly have moved, or been moved, to other work. Signs of age difficulty would, therefore, show not as low production but as a tendency for older people to leave the job (10). The older people who remained might achieve a high rate of production, but they would not be a representative sample of their age group. Evidence that this is what happens in semi-skilled work has been presented by King (7), and in very heavy work by Richardson (9) and Belbin (1). Production figures are, therefore, useless for studying age changes unless proper account can be taken of people leaving or, preferably, unless the operations concerned have a very stable labor force.

Many high-grade skilled jobs possess the desired stability but present another difficulty for study, namely that the work is unstandardized and no individual production records are kept. However, the recent introduction of incentive schemes within the printing industry has provided production records for high-grade skilled operations manned by a relatively stable labor force. The present paper is an attempt to see how far these can yield useful evidence regarding the maintenance of printing skills into old age. The data are by no means without shortcomings, but do seem capable of giving some tentative indications regarding the capacities of the older employees studied.

The present study was carried out with the cooperation of 2 printing firms. Readers, hand-compositors, and machine-compositors were selected for study at both printing works, because the quantity and quality of their output are entirely dependent on the individual craftsmen. Machine-minders were also studied at one firm. No attempt has been made to consider differences due to content of manuscripts, nor to compare performances on one specific task within a total operation.

It must be stressed that no comparison may be made between the two firms. The incentive schemes were based on performance studies of individual craftsmen in both cases. In Works A the scheme was applied in a straightforward way, and quality of work was controlled to some extent by monetary awards based on a rating system. In Works B, an adjustment to a man's performance figure was made in arriving at a figure for payment by the application of the formula:

$$\text{Paid Performance} = \frac{\text{True Performance} + 133}{2}$$

with a fixed upper limit for paid performance. The purpose of this stabilizer was to compensate a man who maintained the quality of his work at the expense of speed. True performance has been studied here, but it must be borne in mind that the stabilizer may have affected willingness to work and, thus, the figures for true performance as well as those for paid performance.

Labor turnover was negligibly small at both printing works. This stability of the labor force is strengthened by the employment position within the industry. Under agreements with trade unions, the number of apprentices recruited annually is controlled by the number of journeymen in each section. It is, therefore, necessary in order to increase the number of apprentices to maintain the number of skilled

Submitted for publication May 21, 1956.
This study was made possible by the generous cooperation of the Printer at each press, and appreciation is expressed to them and all the members of their staffs for their help. My sincere thanks are also due to Mr. A. T. Welford, Director of the Nuffield Unit, for his advice and criticism at all stages of the study.

craftsmen. The period of apprenticeship averages 5 years and this together with 2 years' National Service means that an apprentice is not ready to take his place as a craftsman for about 7 years. Any quick increase of production will, therefore, depend on the men already employed. This position favors the older men, and at both works a few craftsmen were retained after reaching retirement age.

The incentive schemes were introduced with the expressed purpose of increasing productive efficiency. Some measure of the relationship between age and increased output over a period of 3 years following the introduction of the schemes in these 2 works has therefore been attempted, in terms of the percentage difference between an individual's mean performance for the first 13 weeks studied and that for the last 13 weeks.

The records have thus been examined with 2 questions in mind: 1) Do they provide any evidence of a change of performance with age? 2) How far do the older men respond to an incentive scheme?

Machine Compositors.—The machine compositor sits in front of a keyboard containing about 280 keys, each marked with a letter or character. When he hits a key, compressed air is released to pistons which cause punches to rise, making 2 perforations in a continuous roll of paper. Before starting a job, the machine compositor sets a pointer on a celluloid scale to the measure in which he is to compose. When he is nearing the end of a line, a bell rings and then he has to space the line from information given on a cylindrical scale set over the keyboard. He works from copy in a holder at the left of the board and has to alter the position of this as he proceeds (5). Apart from the perforations in the roll of paper and the warning bell, he has no knowledge of the results of his actions.

During his training an apprentice compositor spends some time on machine composition and, if he shows aptitude for the job, will have the opportunity of acquiring experience of it after completing his apprenticeship. It is considered that it takes about 10 years on the job itself to become a highly skilled operator. Some machine compositors specialize in mathematical composition, others in foreign lettering, e.g., Arabic, Russian.

It would seem from superficial observation that, having learned the positions on the keyboard and being able to control the speed of work, a man would be able to continue on the job without difficulty until a late age. The visual-motor skill may be compared to that of typing. However, at Works A the job was considered strenuous for the older operator—although there was no evidence to support this opinion—and, until recently, it was the practice to transfer men to other work, usually to reading, on reaching the age of 50. A change in the method of selecting readers has, however, resulted in the retention of older men on machine composition during the last few years. Although at Works B men were kept on in the department until retiring age, 4 of the 11 men over 50 requested to be excluded from the incentive scheme on the grounds that they did not want to be "pushed" by having to record their output. In a classification of all the machine compositors according to level of output, made by their supervisor, these men were placed significantly lower than those in the scheme ($P < .05$).* This comparison may be taken to be reliable since a highly significant correlation was found between the classification rankings and the performance figures of the men in the scheme ($P < .001$).

At Works A the men in their forties and over not only produced more than the younger men ($P < .01$) (table 1), but were rated higher for the quality of their work ($P < .05$). This relationship cannot, however, be considered as typical because the younger men were relatively inexperienced. Those in their thirties had only just started on the job after returning from War Service and were considered slower in learning than men in their twenties.

A truer picture is no doubt presented by the finding at Works B that output was remarkably similar during the twenties, thirties, and forties, and fell very slightly in the fifties (table 1), although here too the fact that some of the older men, who had opted out of the scheme, were not included, undoubtedly masks age trends. The 50-59 group, however, divided rather sharply into two: 3 men who were among the quickest operators in the section and the other 3 who were among the slowest. No decline in their rate of working was observed during the period studied. On the contrary, the men in their fifties compared to those under 50, showed significantly higher percentage in-

* The tests of significance used throughout are those based on the ranking method developed by Kendall (6).

TABLE 1. MEAN PERFORMANCE FIGURES FOR EACH AGE GROUP, IN EACH OF THE 3 YEARS IMMEDIATELY FOLLOWING THE INTRODUCTION OF THE INCENTIVE SCHEME. MACHINE COMPOSITORS.

WORKS A.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
20+	3	72.0	—	—	2	80.0	—	—	2	106.5	—	—
30+	5	80.4	22.9	28.5	7	92.4	18.6	20.2	7	99.4	16.5	16.6
40+	4	136.3	12.0	8.8	4	141.0	12.3	8.7	4	138.2	10.9	7.9
50+	2	119.5	—	—	2	125.0	—	—	2	127.5	—	—

WORKS B.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
20+	5	117.6	17.9	15.2	5	126.5	18.3	14.5	5	125.5	17.4	13.9
30+	3	114.7	1.6	1.4	3	126.0	2.7	2.1	4	127.0	14.1	11.1
40+	6	120.3	6.5	4.3	6	127.7	5.9	4.6	6	122.3	5.4	4.4
50+	6	113.0	17.9	15.9	6	119.5	19.5	16.3	5	114.8	25.6	22.3
60+	1	97.9	—	—	1	101.0	—	—	1	94.9	—	—

s.d = standard deviation C of V = coefficient of variation.

crease in their output for the last quarter studied compared to that in the first quarter ($P < .02$).

At Works A, on the other hand, it was the younger men who showed the greatest improvement ($P < .02$). This finding is probably due to the fact, already mentioned, that the younger men were gaining experience.

Machine composition seems to be a job on which achievement may improve during the thirties and then be maintained until the fifties, after which a slight loss of speed may occur. This is due in part to the older men working more continuously. A study of the time "lost" during one day, carried out by the Time Study department at Works A, showed that the older men wasted significantly less time than the younger. This was due not only to the amount of time they saved through not having to ask questions about the work, but also to the fact that they took less advantage of the authorized rest pauses. While this is no doubt an indication of the greater efficiency of the older men, it might also be considered as a sign of a greater effort required to maintain the level of output.

Hand Compositors.—The work of the compositor may very roughly be said to consist of (a) handsetting: this may range from single letters exchanged or inserted during correction, to the whole text; (b) make-up: this involves the division of machine-set type into pages, with responsibility for alignment, spacing, and insertion of titles, page numbers, etc.; (c) imposition: this is considered the "heaviest" job, and involves the locking of type into frames in such a way that the pages when folded will run consecutively (3).

As compared with machine composition, the work of the hand compositor makes heavier physical demands on the operator and places a load on short-term memory.

At Works A, where the compositors tended to specialize in the subject-matter, e.g., languages, music, mathematics, and to carry out all the processes on each job, output rose from the twenties to the forties, remained very steady but at a slightly lower level in the fifties, and fell in the sixties (table 2). Unskilled helpers assisted with the "heavy" operations, such as lifting and carrying the plates. However, the amount of assistance given was not standardized and it would be difficult to assess how much help any individual craftsman received.

At Works B, where the compositors tended to specialize in one process and a job was handled in assembly-line fashion, the men in

their thirties gave significantly higher performances than those over 50 ($P < .01$) in each of the 3 years studied. The consistently larger variability within the 40-49 age group compared to the others suggests that while some men in their forties maintained a high level of output, others had already begun to slow down. About half the men reaching retiring age were kept on, but they have not influenced the correlations very much as half this 65+ group opted out of the incentive scheme.

The younger men at Works A showed the greatest improvement in their performances in the last quarter compared to those in the first quarter ($P < .01$), doubtless for the same reason as the younger machine compositors. Although 75 per cent of the compositors at Works B showed an improvement in output, there was no relationship between extent of improvement and age.

The differences between the 2 firms in the relationship between age and output suggest that the situation in which a series of operations is carried out by the same compositor is more favorable to the older man than that in which he is required to carry out one operation repeatedly. By the time a compositor has completed his apprenticeship, he has a good knowledge of how to carry out all the operations involved. If he concentrates largely on one process he will be able to work up a good speed on it, reaching a peak in his thirties. The present evidence suggests that he will be unlikely to maintain this high rate throughout his forties, and by the time he is in his fifties will show a substantial loss of speed.

If, on the other hand, a compositor specializes in the subject-matter rather than in a process, the experience he builds up may help him to compensate for any loss of speed as he grows older in carrying out any of the skilled manual tasks involved. For example, while the over-all time per job may be similar, the time in which each component operation is completed may vary substantially between younger and older. Unfortunately it has not been possible to collect any quantitative evidence of this. Observations suggest, however, that previous experience with a particular lay-out, for instance, will reduce the initial time a compositor spends on his copy. Again too, familiarity with the special cases of type for language, mathematics, or music composition, will enable a compositor to select type more quickly. The acquisition of such knowledge depends on similarity of material over a long period, and specialization of this kind may not often be found. A further point possibly favoring older men is that when a

TABLE 2. MEAN PERFORMANCE FIGURES FOR EACH AGE GROUP, IN EACH OF THE 3 YEARS IMMEDIATELY FOLLOWING THE INTRODUCTION OF THE INCENTIVE SCHEME. HAND COMPOSITORS.

WORKS A.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
20+	2	94.5	—	—	2	96.5	—	—	2	104.0	—	—
30+	16	121.8	10.1	8.3	16	123.1	10.5	8.5	15	125.9	8.5	6.7
40+	11	126.6	9.7	7.7	12	128.6	9.1	7.1	12	133.6	9.4	7.0
50+	5	124.0	6.7	5.4	5	127.6	3.0	2.4	5	130.2	3.6	2.8
60+	5	119.4	10.7	8.9	4	118.3	12.2	10.3	2	117.0	—	—

WORKS B.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
20+	1	125.0	—	—	3	115.9	16.6	14.3	3	114.3	13.9	12.2
30+	10	140.7	16.9	12.0	11	140.9	16.9	12.0	11	142.9	15.8	11.1
40+	19	126.9	28.7	22.6	20	131.2	25.7	19.6	20	133.2	28.4	21.3
50+	15	118.2	19.8	16.7	17	119.1	18.8	15.8	17	120.5	17.4	14.4
60+	11	117.5	12.3	10.7	12	119.7	15.4	12.9	12	124.6	15.1	12.1

s.d = standard deviation C of V = coefficient of variation.

compositor has to complete a whole job, he can plan his work more flexibly. It has been observed, for instance, that whereas a young compositor will finish one job before starting the next, the older man will bring several jobs up to the imposing stage and then finish them all together.

Readers.—Each man works alone in a reading "box." He has to check a proof for (a) typographical errors, such as in spelling, punctuation, omissions from or additions to the manuscript, and in centering and spacing; (b) consistency and, as far as possible, accuracy in an author's statement; and (c) accuracy in the compilation of an index, footnotes, etc. A first proof reader must read each proof twice: the first time he compares it with the copy, a few words at a time. He places a ruler under the line of copy and indicates the corresponding line in the proof with a pen which he moves from letter to letter along the line. Every error must be corrected at once in ink. The second reading is to check for consistency, etc. A press proof reader is responsible for the final check before printing. He reads the proof without referring to the copy (3). No differences were found between the performance figures of the 2 groups of readers at either press; therefore, they have all been treated together.

There is no period of apprenticeship for readers, who are recruited from among compositors, and from outside. Graduates are employed as specialists in, for example, languages. At Works A they were included in the incentive scheme and, therefore, in the present study. There were, however, no differences between their performance figures and those of the other readers. At Works B graduates were not in the incentive scheme.

During training great stress is laid on accuracy and a reader is closely watched if he is working at a greater speed than is considered safe. This, no doubt, accounts for the finding at Works A that readers with the longest experience—but not necessarily the oldest men, as several had been transferred from machine composition in their fifties—produced significantly more than those with less experience of the job ($P < .001$). The older readers were rated lower for quality than the younger men ($P < .01$). It has been suggested that they miss some errors because they have been observed to "nod" over their work and thus lose their place in the proof, although there is no direct evidence of this. Why some of the older readers are less resistant to the difficulties of keeping awake during this somewhat soporific work is not clear but would seem worth further consideration. Possibly the control of atmospheric conditions to avoid inadequate air-movement etc., would benefit older men proportionately more than younger.

TABLE 3. MEAN PERFORMANCE FIGURES FOR EACH AGE GROUP, IN EACH OF THE 3 YEARS IMMEDIATELY FOLLOWING THE INTRODUCTION OF THE INCENTIVE SCHEME. READERS.

WORKS A.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
20+	–				–				2	81.0	—	—
30+	3	123.8	13.8	11.1	3	130.4	14.9	11.5	5	121.5	10.1	8.3
40+	2	115.3	—	—	2	117.1	—	—	3	119.1	5.5	4.6
50+	3	128.5	7.5	5.9	3	133.6	11.2	8.4	3	133.1	11.6	10.9
60+	3	122.6	9.8	8.2	3	126.6	12.1	9.6	3	127.4	20.0	15.7

WORKS B.

Age Group	First Year				Second Year				Third Year			
	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V	N	Mean	s. d.	C of V
Under 50	7	129.1	11.8	9.2	9	130.9	15.6	11.9	9	130.9	11.7	9.0
50–59	7	140.8	11.7	8.3	6	148.4	14.3	9.6	6	152.3	9.9	6.5
60+	8	133.5	21.5	16.1	7	138.4	23.7	17.1	8	140.3	29.8	21.3

s.d = standard deviation C of V = coefficient of variation.

At works B the readers in their twenties, thirties, and forties were grouped together, as their performance figures were similar and showed no trends with age. In each of the 3 years studied, the 50-59 group gave higher performances than the younger group ($P < .1$; $P < .05$; $P < .01$). There were no significant differences between the readers in their sixties and those in the other 2 groups (table 3).

When the first and last quarter years studied were compared, it was found that only 2 of the 18 readers at Works B, who had been in the department throughout the period, did not show an improvement. Eight readers increased their output by more than 15 per cent and all but 1 of these were over 50. Four of the 12 readers at Works A, who were in the section for the whole period studied, failed to show an improvement in the last quarter compared to the first, and 2 of these were under 40.

Reading appears, therefore, to be a job which may be learned at a relatively late age, and which may be carried on successfully until a man reaches retiring age and in many cases well beyond 65.

Machine Minders (4).—At Works B only, performance figures of machine minders were examined in relation to both age and machine size, but no significant correlations were found. A positive correlation, however, was found between the ages of the minders and the sizes of the machines they operated ($P < .001$; table 4).

Transfers to larger machines are regarded as promotions and are accompanied by corresponding wage increases. Although during his apprenticeship he may have had the opportunity of assisting on the large machines, the young minder starts on small machines and gradually, as he becomes more efficient, moves up to the larger ones. Such transfers are made up to the early fifties. It was, therefore, not surprising to find that the older men were on the large machines.

An interesting observation was that during the period studied, 2 of the 4 minders in their early sixties, and 4 of the 11 in their fifties were moved from larger to smaller machines. Of the 8 men who retired during the same period, 3 had been employed on large machines until retirement, but 2 had been moved to lighter work. All these transfers were made *at their own request*, when the men returned to work after illness. (A study of absenteeism in relation to age among readers, hand-compositors, and machine-compositors at Works A had shown no trends with age.) In view of the fact that Richardson (9) had found that older men in heavy industries asked to be moved on to lighter work following an absence through illness, it seems worthwhile to consider the demands, in terms of speed and heaviness, made by the different sized machines.

TABLE 4. DISTRIBUTION OF MACHINE MINDERS ACCORDING TO AGE AND TO THE SIZE OF THE MACHINE OPERATED. (MACHINES ARE RANKED FROM SMALLEST TO LARGEST).

Age Group	Size of Machine Operated								Total
	1	2	3	4	5	6	7	8	
'Teens	4	3	–	–	–	–	–	–	7
20+	5	3	1	1	–	2	–	–	12
30+	1	–	2	2	1	2	2	–	10
40+	1	–	2	–	1	2	–	–	6
50+	–	3	1	1	1	3	–	2	11
60-65	1	1	–	–	–	2	–	–	4
66+	–	–	1	–	–	–	–	1	2
Total	12	10	7	4	3	11	2	3	52

1. The amount of actual heavy physical exertion, such as lifting, climbing, and stretching, increases gradually from the smallest to the largest machine. Most of the heavy lifting, however, is done by the machine assistant. While a positive correlation was found between the ages of the minders and assistants working on the same machine ($P < .02$), there was only one instance of an older assistant requesting a transfer to light work. It would seem therefore that demands for physical effort cannot be the crucial difficulty for machine minders.

2. On smaller machines, the cycle of operations from the preparation of the machine to the completion of printing is shorter than on the larger machines and, therefore, more jobs are handled in a given time. In terms of speed in this sense, therefore, the operation of small machines is probably more suited to younger men. The actual speeds at which the machines operate may vary, but the upper limits are controlled.

3. The more efficient men are usually placed on the larger machines. The most efficient minder is the one who operates his machine with the fewest stops. This emphasis on a steady, accurate performance is well suited to the older man's capacity. However, the results

of errors, such as jamming of the machine and failure of the ink flow, are more serious on the larger machines and involve greater financial loss. The resulting responsibility causes too much anxiety to an older man who is also worried about his health.

4. The number of points the minder has to attend to increases with the size of the machine and they are distributed over a wider field. This increased span of attention imposes greater visual and mental strains, which may prove too much for the older minder and, in this sense, be too "heavy."

These considerations would seem to suggest that if a move to a smaller machine does in fact "lighten" the work for an older man, it does so in terms of responsibility and span of attention rather than in the physical demands of the job.

Discussion.—The present data are limited in scope, as almost all data of this kind are likely to be, where the numbers of skilled craftsmen employed on any job are small. The absence of individual output records prior to the introduction of the incentive schemes make the assessment of their effects in relation to age difficult; however an over-all increase in output has resulted in both printing works. Any change in selection or training methods over, say, the last 20 or so years, that might influence a comparison between older and younger craftsmen, is offset by the apprentice system whereby the older journeyman teaches the young recruit. Machine-composition may be an exception to this. There is no long tradition on the job comparable to the other jobs. The process was introduced in these printing works within the working lives of some of the older men at present employed, who started to learn the job in their late twenties. The question has been raised as to how far improved training conditions will enable men to maintain quantity and quality of output until a late age. If this proves to be so, the job would be exceptional, as the trends are clearly present in hand-composition also.

The fall of performance with increasing age that has been observed is in all cases small. It might have been shown to be higher had all the older men who opted out of the incentive schemes been included. Due to the stability of employment, however, the data provide a more reliable picture of age trends than can be obtained from semi-skilled jobs where large numbers leave or are transferred. Of course, some transfers and promotions take place in all groups and while transfers of less efficient men may mask any decline in output with age, this would be counter-balanced by the promotions of the more efficient men. The transfers are, however, so few that their influence is likely to be in any case small.

The present data appear to confirm the view that performance of high-grade skilled work can be maintained relatively well until at least the normal retiring age. The small fall in performance that has been found becomes noticeable at about 50 years of age, which appears to be a crucial age at which difficulty occurs both in certain classes of industrial operation (1) and on experimental tasks (2). The one exception in the present study is provided by the readers, whose work involves less rapid sensorimotor activity than, for example, typesetting, and less physical effort than some of the hand-composition processes. It is perhaps surprising that the fall of performance among machine minders (indicated by moving to smaller machines) was not larger in view of the fact that the characteristics of the job—pacing with movement of the whole body—are similar to those of operations found by Belbin to show very severe age difficulties.

As has often been observed (11) variability between individuals increases with age, and although the mean performances of the older groups may fall, there are men within these groups who do as well as, or even better than, the majority of younger men. This is clearly so at both works and on each of the jobs studied. The present data do not support Muscio's (8) statement that individual differences were greater among hand-compositors than among other groups in the printing industry.

The question remains as to how the older men are able to maintain their performance. No certain answer can be given on this point, but the work would seem to have 3 characteristics favoring older men. First, the skills are learned in youth and practiced continuously throughout their working lives. Second, the skills are not too rigid to allow of some variation in working methods, either of the time taken or the serial order of operations, and compensation for loss of speed may be found in their wider knowledge of the job and in greater accuracy. Third, in a craft the standard of performance is of higher importance relative to

rate of work than it is on some other jobs. The stabilized incentive scheme at one press and the monetary awards for quality at the other emphasized this by encouraging the slow but accurate worker.

At both printing works there was a general increase in output following the introduction of the incentive schemes. It is surprising to find only two instances of younger men showing greater percentage improvement than the older men, because not only would one expect increased output as the younger men became more experienced, but also because the men in their forties and over contributed most to the original assessment of incentive values. It seems, however, that under incentive conditions and where he has been working well within his capacity, the older skilled craftsman may improve or at least maintain his rate of working.

SUMMARY

A study was made of individual production records of machine-compositors, hand-compositors, and readers over a 3-year period immediately following the introduction of incentive schemes at 2 printing works. Declines of performance with age were small but were observed from about 50 years and upwards, except among older readers, who maintained their output at a higher level than younger men until retirement. These findings on highly skilled work are qualitatively similar to previous studies of semi-skilled work, but seem to be less marked.

REFERENCES

1. Belbin, R.M.: Difficulties of Older People in Industry. *Occup. Psychol., 27:* 177-190, 1953.
2. Brown, R. A.: Unpublished Nuffield Research Unit Report.
3. Central Youth Employment Executive: *Printing—Composing Room Crafts,* Choice of Careers, New Series, No. 46, Her Majesty's Stationery Office, London, 1953.
4. Central Youth Employment Executive: *Printing—Machine Room Workers,* Choice of Careers, New Series, No. 47, Her Majesty's Stationery Office, London, 1953.
5. Chaundy, T. W., Barrett, P. R., and Batey, C.: *The Printing of Mathematics,* Oxford University Press, London, 1954.
6. Kendall, M. G.: *Rank Correlation Methods,* Charles Griffin and Company, London, 1948.
7. King, H. F.: An Attempt to Use Production Data in the Study of Age and Performance. *J. Gerontol., 11:* 410-416, 1956.
8. Muscio, B.: The Psycho-Physiological Capacities Required by the Hand Compositor. *Industrial Fatigue Research Board Report No. 16,* His Majesty's Stationery Office, London, 1922, pp. 5-37.
9. Richardson, I. M.: Age and Work: A Study of 489 Men in Heavy Industry. *Brit. J. Indus. Med., 10:* 269, 1953.
10. Welford, A. T.: *Skill and Age: An Experimental Approach.* Oxford University Press, London, 1951.
11. Welford, A. T.: Changes of Human Performance with Age. *Tr. Assn. Indus. Med. Officers, 2:* 78-82, 1952.

BOOK REVIEWS

THE DYNAMICS OF AGING, by Ethel Sabin Smith, Ph.D. W. W. Norton & Co. Inc., New York, 1956, 191 pages, $2.95.

Professor Emeritus Smith has put together a book which clearly represents a sound approach to satisfaction in the later years. As a psychologist, philosopher, and a retiree, herself, she was able to formulate a document which harmonizes scientific principles and value judgments based on her own rich reading and experience.

Perhaps the major contribution of the book is the precise statement of personal drives which must be satisfied throughout life. Retirement is described as a period of release from goal pressures and routine, and opportunity for self-realization through enjoyment of the cultural heritage, new associations, and adherence to personal values.

Psychologist Smith stresses the responsibility of the individual, recognizes society's obligation to provide a permissive environment, but has little to say about the kind of society that will give the older individual opportunity for self-esteem and self-realization.

CLARK TIBBITTS, Chairman
Committee on Aging
U. S. Department of Health, Education, and Welfare

NORTH CAROLINA: THREE PUBLICATIONS ON RECREATION FOR THE AGING

No state has gone more thoroughly into the matter of recreation for its older population than North Carolina. The various state and regional conferences sponsored by the North Carolina Recreation Commission and the numerous well-rounded and effective local programs developed under its initiative clearly place the state in the front rank on this aspect of aging.

Now come 3 publications issued by the Institute for Research in Social Science of the University of North Carolina which should prove of genuine interest to any one working in the field of gerontology. All 3 are primarily the work of Harold D. Meyer, Professor of Sociology and Chairman of the Recreation Leadership Curriculum at the University, and Consultant to the North Carolina Recreation Commission, with the aid of the Commission's Director, Ralph J. Andrew. The research and publications themselves were made possible by the financial support of 10 insurance companies.

Recreation for Later Maturity is a 24 page illustrated brochure offered as a guide to the development of recreation groups for senior citizens. It is designed essentially to arouse interest within a community, presents the "why, what and how" in graphic form, and urges action on the part of local groups.

A Manual of Organization Clubs for Senior Citizens is a 32 page booklet which gives a step-by-step description of how such clubs can be organized, with all the do's and don't's that such a description implies. Included is an excellent reading list of source material for the general field.

Recreation for the Aging in North Carolina is the most impressive of the 3 publications. It is a thorough, well-documented piece of research, and, to my knowledge, the first study of its kind undertaken in the United States. Running to 217 pages, lettersize, mimeographed, it summarizes the answers to some 30 questions directed to a significant segment of the state's older population, and presents 50 tables of statistical breakdown of the material under consideration. It devotes a large section to a report of interviews with members of the Golden Age Clubs, with extensive quotations. It devotes another section to a study of the administration, organization, leadership, facilities, finances, and program structure of existing organized recreation groups in the state. And it reproduces the complete format of the research project, together with the actual questionnaires sent out, as a guide (or perhaps a quiet nudge) to any state interested in undertaking a similar study.

Among other things, the report stresses the need to establish a definite rhythm between work and recreation throughout all the life span. It also maintains that to achieve maximum results for the recreation of the older citizens there must be an effective correlation of the basic areas of life—health, education, work and religion, along with recreation.

Although the study is concerned only with North Carolina, much of the data presented can be applied usefully in other sections of the country. The report strongly urges that the Governor's Conference on the Aging be made a permanent organization, and lists 20 specific recommendations for further development of recreation and related programs for the aging within the state.

Single copies of the study may be had by writing to the Institute at Chapel Hill (Box 1139); copies of the 2 other pamphlets are available from the North Carolina Recreation Commission, Education Building Annex, at Raleigh.

MERRILL ROGERS
Committee on Aging
U. S. Department of Health, Education, and Welfare

BUILDINGS FOR THE AGING, a symposium reprinted from *Architectural Record*, May, 1956. Pages 196-226, preceded by an article by Lewis Mumford. Available from the National Committee on the Aging, 345 East 46 Street, New York 17, New York.

The article by Lewis Mumford is clear identification of the three phases of later maturity,—middle-age, senescence, and physiologic deterioration, together with suggestions, particularly in the housing field, for making these phases of life more meaningful and healthy. The papers in the symposium include a description of current housing trends for older people by Mrs. Geneva Mathiasen, statements from the point of view of medical care and personal well-being by Dr. Frederic Zeman and Miss Ollie A. Randall, respectively, a discussion of desirable architectural and community features by Professor Walter K. Vivrett, and an article on planning nursing homes written by the Public Health Service, Department of Health, Education, and Welfare.

The pages are richly illustrated with architects' sketches and photographs of new and projected buildings for housing people who are in Mumford's second and third stages (senescence and physiologic deterioration) of the later years. Emphasis focuses therefore, on housing for those who require protected or custodial living.

CLARK TIBBITTS, Chairman
Committee on Aging
U. S. Department of Health, Education, and Welfare

BOOKS RECEIVED

Books received since July 1 are acknowledged in the following list.

A Manual of Organization—Clubs for Senior Citizens, available from the North Carolina Recreation Commission, Education Building Annex, Raleigh, 1956, 31 pages, paper bound (reviewed in this issue, page 425).

Buildings for the Aging, a symposium reprinted from the *Architectural Record*, May, 1956, pages 196-226, preceded by an article by Lewis Mumford. Available from the National Committee on the Aging, 345 East 46 Street, New York 17 (reviewed in this issue, page 425).

Better Human Relations—The Challenge of Social Work, by Lucy Freeman. Public Affairs Pamphet No. 97A, May, 1956. Public Affairs Committee, 222 East 38 Street, New York 16, 28 pages, paper bound.

Dynamics of Aging, by Ethel Sabin Smith. W. W. Norton & Co., Inc., New York, 1956, 191 pages, $2.95 (reviewed in this issue, page 425).

Fun for Older Adults, by Virginia Stafford and Larry Eisenberg. Parthenon Press, Nashville, Tennessee, 1956, 112 pages, paper bound.

Learn to Earn, A Guide to Job Training Courses for Mature Women in the Metropolitan Area, Washington, D. C., 2nd edition, 1956, 44 pages, multilithed. Available from the Burdick Vocation High School, 1300 Allison Street, N.W., Washington 11, D. C., 10 cents.

Recreation for the Aging in North Carolina (general report). Available from the Institute for Research in Social Science, Box 1139, University of North Carolina, Chapel Hill, 1956, 217 pages, paper bound (reviewed in this issue, page 425).

Recreation for Later Maturity (a brochure). Available from the North Carolina Recreation Commission, Education Building Annex, Raleigh, 1956, 23 pages, paper bound (reviewed in this issue, page 425).

Selected Papers of Joseph W. Mountin, M.D., by the Joseph W. Mountin Memorial Committee, 1956. 358 pages. Available through the American Public Health Association, 1790 Broadway, New York, $5.00.

JOURNAL OF GERONTOLOGY

VOLUME 11, NUMBER 4

OCTOBER, 1956

Section C

Organization Section
Index to Current Periodical Literature
Author Index to Current Periodical Literature
Index to Volume 10

ORGANIZATION SECTION

Gerontological Society, Inc. Council for 1956

President William B. Kountz (St. Louis) Past President Ollie Randall (New York)
President-elect Robert J. Havighurst (Chicago) Treasurer John Esben Kirk (St. Louis)
Secretary Nathan W. Shock (Baltimore)

Program of the Ninth Annual Scientific Meeting of the Gerontological Society, Inc.

November 8, 9, 10, 1956

HOTEL HAMILTON
Chicago, Illinois

E. J. STIEGLITZ, *General Program Chairman*
E. B. BAY, *Local Arrangements Committee Chairman*
J. A. HAMILTON, Section on Biological Sciences
A. A. HELLBAUM, Section on Clinical Medicine
J. E. BIRREN, Section on Psychological and Social Sciences
OLLIE A. RANDALL, Section on Social Work and Administration

WEDNESDAY, NOVEMBER 7

Meeting of the Council of the Gerontological Society, Inc.

5:00-7:00 p.m., Dinner—Chicago Room
7:00-10:00 p.m., Council Meeting—Madison Room

THURSDAY, NOVEMBER 8

8:30-9:30 a.m., Registration—Tenth Floor Foyer

Morning Session, 10:00-12:00 noon—Mirror Room

General Session: Panel on Progress in Gerontology

Chairman: E. B. BAY, Professor of Medicine, University of Chicago

Opening Remarks and Progress in Clinical Geriatric Medicine

BRECKINRIDGE, ELIZABETH—(Illinois Public Aid Commission, Chicago). Progress in Social Work and Administration.

WAKERLIN, G. E.—(Professor and Head, Department of Physiology, College of Medicine, University of Illinois, Chicago). Progress in the Biological Sciences.

HALSTEAD, W. C.—(Professor of Medical Psychology, University of Chicago). Progress in the Psychological and Social Sciences.

12:15-1:30 p.m., Separate Luncheon Meetings for each Professional Section and the General Member Section of the Society

($3.00 per plate. Tickets to be obtained on registration. Location of luncheon meetings will be posted at Registration Desk.)

Afternoon Sessions, 2:00-4:30 p.m.—Simultaneous Section Meetings

Section on Biological Sciences—Aviation Room

Chairman: J. A. HAMILTON, Stanford University School of Medicine, San Francisco

GRAD, B., WILANSKY, D. L., and HOFFMAN, M. M.—(Gerontologic Unit, Allan Memorial Institute of Psychiatry, McGill University, and the McGill University Clinic, Royal Victoria Hospital, Montreal). Changes in Thyroid Function During Aging.

KNISELY, M. H.—(Department of Anatomy, Medical College of South Carolina, Charleston). A Practical Working Hypothesis About *Some* (Not All) Geriatric Processes.

CASARETT, G. W.—(Department of Radiation Biology, University of Rochester School of Medicine and Dentistry, Rochester, New York). Acceleration of Aging by Ionizing Radiation.

RUDZINSKA, MARIA A.—(Rockefeller Institute for Medical Research, New York). Changes in the Structure of the Cytoplasm in Old Organisms of *Tokophrya infusionum* as Revealed by Electron Microscopy.

WILCOX, H. H. —(Department of Anatomy, University of Tennessee Medical Units, Memphis). A Quantitative Study of the Purkinje Cells in Guinea Pigs.

ROGERS, J. B., and SWIGART, R. H. —(Department of Anatomy, University of Louisville School of Medicine). Age Changes in the Vision of Guinea Pigs.

GARBUS, J., and STREICHER, E.—(Section on Aging, National Institute of Mental Health, Bethesda). The Effect of Age and Sex on the Duration of Steroid Anesthesia in the Rat.

ANDREW, W.—(Wake Forest College, Bowman Gray School of Medicine, Winston-Salem, North Carolina). Mesenchymal Cell Aggregations in Various Organs in Old Age.

TONNA, E. A.—(Department of Biology, Graduate School of Arts and Science, New York University, and Hospital for Special Surgery). Respiratory Enzyme Variations in the Aging Periosteum.

Section on Clinical Medicine—Green Room

Chairman: J. T. FREEMAN, Women's Medical College, Philadelphia

CHEWNING, J. B.—(William S. Merrell Co. Cincinnati). Problems of the Mind in Later Life: A Film Report.

SEEGERS, W., MCGAVACK, T. H., and ERK, V.—(New York Medical College, Metropolitan Research Center Unit, New York). The Influence of Oral Insulin Substitutes (the Sulfonyl Ureas) on Thyroid Function of Older People as Measured by I^{131} Uptake.

WOLFF, J. R., and GANZER, H.—(Cancer Prevention Center, Chicago). The Detection of Uterine Cancer in Women After Sixty.

GITMAN, L., KAMHOLTZ, T., and LEVINE, J.—(Brooklyn Hebrew Home and Hospital for the Aged, Brooklyn). Osteoporosis in the Aged: Radiographic Survey and Biochemical Correlations.

SEEGERS, W., HAAR, H., KRAWZOFF, MARIA, ENZINGER, J., and MCGAVACK, T. H.—(New York Medical College, Metropolitan Research Center Unit, New York). The Treatment of Older People with an Estrogen-Androgen-Thyroid Mixture.

SAMUELS, S. S.—(New York City). Management of Peripheral Arterial Disease in the Aged.

JACOBSON, A.—(Asbury Park, New Jersey). The Use of Ritalin in Treating Depressions of the Aged.

Section on Psychological and Social Sciences—Flemish Room

Chairman: J. BOTWINICK, National Institute of Mental Health, Bethesda

Discussant: R. W. KLEEMEIER, Moosehaven Research Laboratory, Orange Park, Florida

SHEPS, J.—(New York City). Psychopathologic Investigation of the Senile Psychosis.

THALER, MARGARET—(Walter Reed Army Institute of Research, Washington, D.C.). Rorschach Patterns of Normal and Senile Aged Persons Contrasted with Young Groups and Interpreted Within Three Personality Theories.

SCHAIE, K. W.—(University of Washington, Seattle). Behavioral Rigidity as a Central Concept in the Analysis of Age Changes in Adult Behavior.

REITAN, R. M.—(Department of Surgery, Indiana University Medical Center, Indianapolis). The Relationship of the Halstead Impairment Index and the Wechsler-Bellevue Total Weighted Score to Chronologic Age.

WEISS, A. D.—(Section on Aging, National Institute of Mental Health, Bethesda). The Relation of A-Wave Latency of the Electroretinogram to Human Aging.

OBRIST, W. D., and HENRY, C. E.—(Institute of Living, Hartford, Connecticut). Progress of Aged Psychiatric Patients in Relation to Diagnosis and EEG Findings.

BOTWINICK, J., BIRREN, J. E., and JEROME, E. A.—(Section on Aging, National Institute of Mental Health, Bethesda). The Use of Light Aversion Motivation in Studies of Aging in Rats.

Section on Social Work and Administration—Chicago Room

Chairman: ELIZABETH BRECKINRIDGE, Supervisor of Services for Aging, Illinois Public Aid Commission, Chicago

Panel: Senile Patients and Their Care

GRINKER, R.—(Psychiatric-Psychosomatic Institute, Michael Reese Hospital, Chicago). Who Are Senile Patients?

KERNER, O.—(Judge, Chicago). What Should Be Done? The Role of the Court.

SHINDELL, S.—(Medical Director, Connecticut Commission on the Care and Treatment of the Chronically Ill, Aged, and Infirm). Who Should Do It? The Role of the Hospital and Community Resources.

4:30-5:30 p.m., Meeting of the Council of the Gerontological Society, Inc.—Madison Room

Evening Session, 8:00 p.m., Illustrated Lecture: Aging in the Atomic Age—Mirror Room

Chairman: W. B. KOUNTZ, President, Gerontological Society, Inc.

Address: A. F. ABT, Chief, Radioisotope Section, Veterans Administration Center, Martinsburg, West Virginia

FRIDAY, NOVEMBER 9

8:30-9:30 a.m., Business Meeting of the Gerontological Society, Inc.—Mirror Room

Morning Session, 9:30 a. m.-12:00 noon—Simultaneous Section Meetings

Section on Biological Sciences—Aviation Room

Chairman: J. B. ROGERS, University of Louisville School of Medicine

ALTSCHUL, R.—(University of Saskatchewan, Saskatoon). The Role of Endothelium in the Initiation of Arteriosclerosis.

SOBEL, H., and MARMORSTON, JESSIE—(Institute for Medical Research, Cedars of Lebanon Hospital, and the University of Southern California, Departments of Biochemistry and Medicine, Los Angeles). Reversibility of the Cortisone-Induced Decrease in the Hexosamine-Collagen Ratio of Connective Tissue.

ROCKSTEIN, M.—(College of Medicine, New York University—Bellevue Medical Center, New York). Longevity of Male and Female House Flies.

GETTY, R., BOWNE, J. G., LOVELL, J. E., and WHITEFORD, R. D.—(Department of Veterinary Anatomy, Iowa State College, Ames). Age Changes on the Common Integument and Sense Organs of the Dog.

WEINBACH, E. C., and GARBUS, J.—(Laboratory of Tropical Diseases, National Institute of Allergy and Infectious Diseases, and the Section on Aging, National Institute of Mental Health, Bethesda). Age and Oxidative Phosphorylation in Rat Liver and Brain.

SIMMS, H. S., and BERG, B. N.—(Department of Pathology, College of Physicians and Surgeons, Columbia University, New York). Longevity in the Rat as Determined by the Rate of Accumulation of Contributory Lesions.

KALLMAN, F. J., KLABER, M. M., JARVIK, L. F., and FALEK, A.—(Department of Medical Genetics, New York State Psychiatric Institute, Columbia University, New York). Longitudinal Trends in a Senescent Twin Population.

YIENGST, M. J., BARROWS, C. H., JR., and SHOCK, N. W.—(Gerontology Branch, National Heart Institute, Bethesda, and the Baltimore City Hospitals, Baltimore). Age Changes in the Chemical Composition of Muscle and Liver in the Rat.

BANFIELD, W. G.—(National Cancer Institute, Bethesda). Age Changes in the Collagen of Human Achilles Tendon, Skin, and Dura.

KIRK, J. E., and SØRENSEN, L. B.—(Division of Gerontology, Washington University School of Medicine, St. Louis). The Aldolase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages.

Section on Clinical Medicine

Clinic at Passavant Memorial Hosiptal

Clinic Presented by C. C. Maher of Northwestern University School of Medicine and Passavant Memorial Hospital

Section on Psychological and Social Sciences—Flemish Room

Symposium: Assessment of Mental Health in the Elderly

Chairman: E. BUSSE, Professor and Chairman, Department of Psychiatry, Duke University

BARNES, R. H.—(Assistant Professor, Department of Psychiatry, Duke University School of Medicine, Durham, North Carolina). Psychiatric Assessment.

COHEN, L. D.—(Associate Professor of Medical Psychology, Duke University School of Medicine, Durham, North Carolina). Psychologic Assessment.

LABARRE, W.—(Professor of Anthropology, Duke University School of Medicine, Durham, North Carolina). Social Assessment.

SILVERMAN, A. J.—(Chief, Stress and Fatigue Division, Aero-Medical Laboratory, U.S.A.F., Dayton, Ohio, on leave of absence from Duke University). Physiologic Assessment.

THALER, MARGARET—(Research Psychologist, Walter Reed Army Institute of Research, Washington, D.C.). Discussant.

Section on Social Work and Administration—Chicago Room

Chairman: GENEVA MATHIASEN, Secretary, National Committee on the Aging, National Social Welfare Assembly, New York

Panel: Adult Boarding Homes and Their Place in Community Resources for Older People

SNYDER, MRS. R.—(Department of Welfare, New York). The Adult Boarding Home in a City Welfare Program.

PEMBERTON, ANNIE MAY—(Supervisor, Services to the Aged, North Carolina State Department of Public Welfare, Raleigh). North Carolina's Experience in Home Placement of Former State Hospital Patients.

CRUTCHER, HESTER—(Director of Social Work, New York State Department of Mental Hygiene, Albany). A Post-Hospital Family Care Program for Older Adults.

2:00-5:00 p.m., General Session—Mirror Room

Symposium: Education for Maturity

Moderator: E. J. STIEGLITZ, Chairman of the Program Committee, Washington, D. C.

Panel:

SHIELDS, T. J., VERY REV. FR., S.J.—(Jesuit High School, Dallas, formerly President, Loyola University, New Orleans).

MADAR, OLGA—(Director, Recreation Department, United Automobile Workers, Detroit).

TERHUNE, W. B.—(Director, Silver Hill Foundation, New Canaan, Connecticut).

HAVIGHURST, R. J.—Professor of Education, University of Chicago; President-Elect, Gerontological Society, Inc.).

6:00 p. m., Cocktails—Grand Ballroom Foyer

7:15 p. m., Annual Dinner—Grand Ballroom

($5.00 per Plate. Tickets at Registration Desk)

Master of Ceremonies: A. I. LANSING, Professor of Anatomy, University of Pittsburgh School of Medicine

Gerontology Comes of Age—W. B. KOUNTZ, President, Gerontological Society, Inc.

An American Doctor's View of Soviet Medicine—P. W. SCHAFER, Director, Television Division, Walter Reed Army Medical Center, Washington, D. C.

SATURDAY, NOVEMBER 10

Morning Sessions, 9:30 a.m.-12:00 noon—Simultaneous Section Meetings

Section on Biological Sciences—Aviation Room

Chairman: H. S. SIMMS, College of Physicians and Surgeons, Columbia University

SODERWALL, A. L., KENT, H. A., and TURBYFILL, C. L.—(University of Oregon, Eugene). Recent Findings in Gerontological Studies of the Golden Hamster (*Mesocricetus auratus*, Waterhouse).

STRONG, L. C.—(Biological Station, Roswell Park Memorial Institute, Springville, New York). Biologic Characteristics of the Aging Process Affecting Litter Spacings in Mice.

STILL, J. W.—(Department of Physiology, George Washington University School of Medicine, Washington, D. C.). Comparison of Blood Viscosity Changes in Old and Young Rats.

SCHRAER, H., SCHRAER, R., and GERSHON-COHEN, J.—(Department of Radiology, Albert Einstein Medical Center, Northern Division, Philadelphia). Urinary Dehydroepiandrosterone (DHA) and 17-Ketosteroid (17-ks) Excretion in the Aged and Its Relation to Bone Density.

GREENBLATT, I. J.—(Messinger Research Laboratory, Beth-El Hospital, Brooklyn). Alteration in Human Blood Serum Lipids with Intravenously Injected Lipid Mobilization Factor.

LUND, L. C., and EDWARDS, R. A.—(Western State Hospital, Hopkinsville, Kentucky). Cerebral Arteriosclerosis in Comparison with Senile Brain Disease in the Aging Process.

BEAN, W. B.—(Department of Internal Medicine, State University of Iowa, Iowa City). Biologic Aspects (of Blood Vessels) of the Skin in Relation to Aging.

CONSTANTINIDES, P., and SAUNDERS, P.—Department of Anatomy, University of British Columbia Medical School, Vancouver). Atherostatic and Lipophage-Stimulating Effects of Manuronate.

FAND, I., and GORDON, A. S.—(Department of Biology, Graduate School of Arts and Science, New York University, and the Creedmoor Institute for Psychologic Studies, New York). A Quantitative Study of the Bone Marrow in the Guinea Pig Throughout Life.

GOLDBLOOM, A. A., EIBER, H. B., and DANISHEFSKY, I.—(New York Medical College—Metropolitan Medical Center, Bird S. Coler Hospital Division, New York). Newer Clinical and Laboratory Studies in the Aged. XIV. Changing Lipoprotein Patterns in the Aged.

BERG, B. N., and HARMISON, C. R.—(Department of Pathology, College of Physicians and Surgeons, Columbia University, New York). Skeletal Growth and Body Weight in Aging Rats.

Section on Clinical Medicine—Green Room

Symposium

Moderator: T. T. MCGAVACK, New York Medical College, New York

ADAMS, W.—(University of Chicago). Cardiovascular Conditions in the Elderly Patient.

FREEMAN, J. T.—(Women's Medical College, Philadelphia). Mental Health and the Aging Patient.

KELLY, K. H.—(City of Hope Medical Center, Duarte, California).—The Terminal Care of the Cancer Patient.

ISHMAEL, W. K.—(University of Oklahoma School of Medicine and Bone and Joint Hospital, Oklahoma City). Arthritis in the Elderly.

Section on Psychological and Social Sciences—Flemish Room

Chairman: WILMA DONAHUE, University of Michigan
Discussant: E. BURGESS, University of Chicago

SALAMONE, A.—(Adult Education Center, St. Louis University, St. Louis). The Older Worker in Business and Industry.

MACK, MARGERY J.—(Mental Health Consultant, Chicago Regional Office, DHEW-PHS). A Pilot Study in the Comparison of the Morale of Older and Younger Employees.

REALS, W. H.—(Washington University, St. Louis). Adult Education for the Aging—Its Limitations.

WILLIAMS, R. H. and LOEB, M. B.—(National Institute of Mental Health, Bethesda, and the Committee on Human Development, University of Chicago). The Adult's Social Life Space and Successful Aging: Some Suggestions for a Conceptual Framework.

WEBBER, I. L.—(Institute of Gerontology, University of Florida, Gainesville). Morbidity of Older People in Relation to Social-Class Position.

HAVIGHURST, R. J.—(Committee on Human Development, University of Chicago). Patterns of Social-Role Performance in Relation to Aging.

ALDRIDGE, G. J.—(Michigan State University, East Lansing). Informal Social Relationships in a Retirement Community.

PETERSON, W. A., and NEUGARTEN, BERNICE L.—(Community Studies, Inc., Kansas City, Missouri, and Committee on Human Development, University of Chicago). Sex and Social Class Perspectives on the Stages of Adulthood.

NEUGARTEN, BERNICE L., and GUTMANN, D. L.—(Committee on Human Development, University of Chicago). A Study of Age Changes in Adult Sex Roles.

Section on Social Work and Administration—Chicago Room

Chairman: J. Kaplan, Hennepin County Welfare Department, Minneapolis

Panel: Planning Education and Recreation Programs for Older Adults

RABE, HENRIETTA—(Supervisor, Education for the Aging, New York State Bureau of Adult Education, Albany). Planning in a State Education Department.

HILL, RUTH—(Director of Community Organization for Aging, Stephenson County, Illinois Public Aid Commission, Freeport). Planning in a Public Assistance Agency.

BOYD, W. H.—(Senior Citizens Steering Committee of the Long Beach Community Welfare Council, Long Beach, California). Planning in a Welfare Council.

Read by Title:

BEATTIE, W. M., JR.—(Director, Community Services to the Aging, Community Welfare Council, Madison). An Analysis of the Relations of Aging to Medical, Social, and Economic Characteristics of Patients as a Basis for an Action Program in Meeting the Health Needs of an Aging Population.

12:00 noon—Adjournment

Abstracts of Papers

SECTION ON BIOLOGICAL SCIENCES

The Role of Endothelium in the Initiation of Arteriosclerosis.

R. ALTSCHUL, *University of Saskatchewan, Saskatoon.*

An important but neglected factor in the pathogenesis of various diseases is the perennial nature of tissues or their normal renewal ("moulting") whether it be rhythmic or irregular. In established vessels, there occurs no mitosis of endothelium. If cell renewal does occur, it will be by direct (amitotic) cell division. This may agree with Peter's law, according to which active cells do not divide by mitosis. Following amitosis, the daughter cells thus formed cannot possess all the chromosomal material necessary for their proper function. A functional insufficiency, e.g., changes in permeability, may well be the sequela. If, on the other hand, endothelium in established vessels be a perennial tissue, its resistance against trauma, mechanical or other, may be expected to be high. Observations by others and tests carried out in our laboratory indicate, however, that endothelium is very vulnerable to mechanical injury. This vulnerability, together with the postulated functional insufficiency as a sequela to amitosis, deserves consideration as a pathogenic factor in arteriosclerosis. Some similar conditions may be seen in the insufficient or lacking regenerability of mature striated muscle which is a perennial tissue and in which nuclear division is either wanting or occurs by direct (amitotic) fission.

Mesenchymal Cell Aggregations in Various Organs in Old Age.

W. ANDREW, *Wake Forest College, Bowman Gray School of Medicine, Winston-Salem, North Carolina.*

Aggregations of cells, chiefly lymphocytes and plasma cells, are seen in many organs in the mouse, rat, and man in old age. Organs studied include the liver, salivary glands, and kidneys. The aggregations are usually in the neighborhood of blood vessels or ducts. Their exact distribution in the various organs is discussed. An attempt is made to ascertain how stable such cell groupings are by a quantitative analysis of cell types and a search for mitotic figures or other evidences of reproduction of cells at the site. In some places, particularly in the liver, an antagonism between these aggregations and the epithelial cells occurs, as evidenced by loss of epithelial cells where the colony of mesenchymal cells has expanded beyond the confines of the connective tissue. The possibility is suggested of a relationship between these aggregations of "ectopic" mesenchymal tissue and the general changes which occur in lymphoid tissue in senility.

Age Changes in the Collagen of Human Achilles Tendon, Skin, and Dura.

W. G. BANFIELD, *National Cancer Institute, Bethesda.*

Collagen subjected to 1:1000 dilution of glacial acetic acid reacts differently depending upon the age of the individual and the site from which it is obtained. Below one year of age collagen from Achilles tendon, skin, and dura is generally more highly soluble in 1:1000 dilution of acetic acid than collagen from older individuals. Above one year of age the solubility decreases markedly but variably depending upon the site from which the collagen is obtained. Although the structure of skin prevents it from being used for acid-swelling studies, Achilles tendon is suitable. When the acid-swelling capacities of Achilles tendon is measured it is found to increase to the approximate age of 26 after which there is a decrease in the swelling capacity to about 60 years of age. Tendons from individuals older than 60 years have virtually no swelling in a 1:1000 dilution of acetic acid. There will be a discussion of the possible significance of these observations.

Biologic Aspects (of Blood Vessels) of the Skin in Relation to Aging.

W. B. BEAN, *Department of Internal Medicine, State University of Iowa, University Hospitals, Iowa City.*

A series of observations on the natural history of certain vascular lesions of the skin demonstrated a secular trend with increase in frequency of occurrence, in number of individual lesions, and in size of various lesions with increasing age. These changes in visible vessels in the skin chiefly affect those on the venous side of the capillaries, but also involve the capillaries themselves. They consist of dilation, overgrowth, and enlargement of veins with telangiectatic alterations. The arterial spider of the skin and angiomatous or proliferative change may occur as a birth mark and may also appear as a proliferative vascular alteration in patients with cirrhosis of the liver in relapse; and in normal women during pregnancy.

The vascular alterations in Osler's disease, a genetic weakness of the vascular structure, have recently been demonstrated to be in a dynamic state with a slow appearance of new lesions and disappearance of old ones. The biologic implications of such observations will be discussed.

Skeletal Growth and Body Weight in Aging Rats.

B. N. BERG AND C. R. HARMISON, *Department of Pathology, College of Physicians and Surgeons, Columbia University, New York.*

Growth in Sprague-Dawley rats of both sexes was studied in terms of tibia length and body weight from weaning at 28 days to 1200 days of age.

The tibia grew rapidly up to 175 days of age and then continued to increase in length by small but statistically significant increments until about 700 days. In older animals the size of the tibia decreased slightly. Even in the oldest rats the proximal epiphysis remained ununited.

Body weight increased continuously by diminishing increments until 525 days in males and until 770 days in females. Up to these ages a plot of the log of body weight against a log reciprocal time was a straight line,

with a steeper slope for males than for females. Peak weights were followed by a drop when disease set in. Throughout the life span the incidence and severity of disease were greater in males than in females of the same age. Maximal body weight and tibia length were attained simultaneously in females, while in males tibia growth continued for approximately 140 days after peak weight.

Since tibia growth ceased at about the time that disease appeared, but the proximal epiphysis did not close, the full potential of skeletal growth in the aging rat could be determined only in the absence of disease.

Acceleration of Aging by Ionizing Radiation.

G. W. CASARETT, *Department of Radiation Biology, University of Rochester School of Medicine and Dentistry, Rochester, New York.*

Animals irradiated total-body and escaping death initially recover clinically but subsequently tend to die prematurely. They seem generally and histopathologically to have aged prematurely. Some data indicate that at their respective median death times, populations of animals irradiated total-body have about the same incidence of the same diseases as do control animals, suggesting that irradiation produces primarily the syndrome of premature aging, with related disease, rather than induces directly all of the diseases of advanced age. In comparison, premature death from partial-body irradiation or irradiation from internal radioactive materials concentrating differentially in various tissues of the body may be due more often to specific disease induced directly. However, even in such cases if many organs and tissues of the body are irradiated substantially, the rate of the generalized, diffuse deterioration (aging) observed histopathologically seems accelerated.

The purpose of this paper is to define in histopathologic terms the phenomenon of acceleration of aging by irradiation and to present data obtained largely in a long-term histopathologic and hematologic study of the sequence of changes occurring in the organs of rats receiving single intravenous doses of polonium. Polonium is an element which emits alpha particles and which, in the amounts given, is negligible with respect to chemical quantity and toxicity. Accelerated aging was most prominent in blood and hemopoietic tissues (bone marrow, lymph nodes, spleen), thymus, testis, blood vessels, bone growth centers, and connective tissues. The influence on aging processes of the nephrosclerosis induced at certain dose levels will be discussed.

This paper is based on work performed under contract with the United States Atomic Energy Commission at the University of Rochester Atomic Energy Project, Rochester, New York.

Atherostatic and Lipophage-Stimulating Effects of Manuronate.

P. CONSTANTINIDES AND P. SAUNDERS, *Department of Anatomy, University of British Columbia Medical School, Vancouver.*

Injections of Manuronate (Wyeth), a synthetic heparin-like anticoagulant, were started in rabbits some time after the development of atherosclerosis and were carried on in the presence of continued cholesterol feeding.

Manuronate suppressed the lipemia, reduced the hypercholesteremia, and inhibited the progress of atherosclerosis. In addition, this compound greatly increased the uptake of lipids by the spleen and caused the appearance of foam cells in renal glomeruli.

Given without concomitant cholesterol feeding, manuronate failed to mobilize lipids into the spleen and did not produce any glomerular foam cells.

Thus some effects of manuronate simulated those of sulfated alginic acid, a closely related (but non-anticoagulant) sulfated polysaccharide.

Supported by a grant of the American Life Insurance Company.

A Quantitative Study of the Bone Marrow in the Quinea Pig Throughout Life.

I. FAND, AND A. S. GORDON, *Department of Biology, Graduate School of Arts and Science, New York University, and the Creedmoor Institute for Psychologic Studies, New York.*

The femoral bone marrow was examined in a series of 104 guinea pigs of both sexes ranging from 1 to 1820 days of age. A quantitative method of bone marrow analysis was employed whereby the absolute numbers of the different cellular types could be determined for the whole marrow mass. The method consisted in weighing femurs before and after demedullation followed by suitable dilution, suspension, staining, and chamber counting of the marrow elements. Peripheral blood cell measurements were taken from cardiac blood. Histologic sections of contralateral femurs were examined for the over-all cellular relations.

When the cellular composition of the femoral marrow was considered as a function of age, it was found that in the first weeks of life the marrow was characterized by elevated "blastic" numbers, higher lymphocytic, and nucleated erythrocytic counts associated with lowered granulocytic concentrations. During maturity, the numbers of "blastic," lymphocytic, and erythrocytic elements remained relatively constant. This was followed by a significant decline in the absolute numbers of these cells in the postmature and senile animals. On the other hand, granulocytic numbers were found to rise continually throughout old age. The M-E ratios mirrored this developing granulocytic dominance over the erythoid elements in the aged subjects.

Histologic analysis of the bone marrow revealed a condition of progressive fatty replacement of hemopoietic foci commencing in early maturity and reaching a peak in late senescence.

The Effect of Age and Sex on the Duration of Steroid Anesthesia in the Rat.

J. GARBUS AND E. STREICHER, *Section on Aging, National Institute of Mental Health, Bethesda.*

Physiologic changes with age in the intact animal can be studied by measuring a response to a drug. Previous work has shown that age and sex significantly alter the duration of hexobarbital anesthesia in the rat. Because of the known involvement of sex hormones in the detoxification of hexobarbital these differences can be ascribed to age changes in sex hormone levels. It is also known that certain steroids are anesthetics. Consequently the effect of age and sex on the duration of steroid anesthesia in the rat has been studied.

The anesthetic hydroxydione (Viadril), a water soluble steroid, was administered at a dose of 62.5 mg./Kg.

to unfasted Sprague-Dawley rats ranging in age from 1 to 34 months. The induction time to the loss of the righting reflex and the sleeping time until the return of that reflex were measured. In other experiments, SKF 525A, 15 mg./Kg., and chlorpromazine, 15 mg./Kg., both shown to potentiate hexobarbital anesthesia, were administered 40 minutes prior to the injection of the hydroxydione.

No significant sex differences at any age were found. Induction time was shorter for the one month animals when compared to older animals. No induction or sleeping time differences were found between the oldest group (28-34 months) and mature animals (6-13 months). Chlorpromazine served to shorten induction time and both chlorpromazine and SKF 525A prolonged the duration of anesthesia. These as well as other relations will be discussed in the light of known mechanisms of drug action.

Age Changes in the Common Integument and Sense Organs of the Dog.

R. GETTY, J. G. BOWNE, J. E. LOVELL, AND R. D. WHITEFORD, *Department of Veterinary Anatomy, Iowa State College, Ames.*

Studies have been in progress in the Department of Anatomy, Division of Veterinary Medicine, at Iowa State College for the past 3 years on age changes in the common integument and sense organs of the dog.

Skin samples from 12 different areas from 13 normal dogs ranging in age from birth to 28 weeks were studied microscopically. A total of 140 skin areas were studied. Observations have been made on the morphology, location of glycogen, and distribution of alkaline phosphatase in normal canine skin at various ages. In addition, the developmental increase in the thickness of the epidermis of the skin of the dog from birth to maturity was studied. The hair follicles were observed to develop from a simple form at birth to a compound form at 28 weeks of age. At the time of birth it was observed that the sudoriparous and sebaceous glands were well developed and functional.

The tongues of 31 dogs were studied in order to determine age changes of the lingual papillae. A pattern was established for the structure and distribution of the lingual papillae of the dog.

The eyes of 16 dogs were studied macroscopically and microscopically to determine the structure of the mature eye, and to describe the growth changes that occurred from birth to 2 years of age. The results of this study indicate that the canine eye is structurally mature at 6 to 8 weeks of age. At birth the eye had the form of a sphere: at the age of 6 weeks it had the form of an oblate spheroid, the form typical of the mammalian eye. The eye grew most rapidly the first 8 weeks of postnatal life and reached growth maturity at 28 weeks of age. Specific details of structure that varied from the human eye will be discussed.

Newer Clinical and Laboratory Studies in the Aged. XIV. Changing Lipoprotein Patterns in the Aged.

A. A. GOLDBLOOM, H. B. EIBER, AND I. DANISHEFSKY, *New York Medical College-Metropolitan Medical Center, Bird S. Coler Hospital Division, New York.*

Five years ago a study of 100 normal patients aged 80 to 100 years was undertaken at a chronic institution. At that time it was shown that the lipoprotein patterns obtained by analytic ultracentrifugal methods were comparable to similar determinations in the 30 to 50 year age group.

Of the remaining original patients still confined in the same institution, 22 patients were re-studied. The results showed that, with constant conditions prevailing over the past 3 years, 55 per cent of the patients had an increased atherogenic index (A. I.), 18 per cent showed decreased values, and 27 per cent remained the same, as compared with their original values.

The average atherogenic index of this group 3 years ago was 56.8; the average now is 70.4. However, this average is still significantly below the values for the 50 to 70 year group. These basic changing values have hitherto been unreported in the literature.

Year		1953			1956		
Sf	Components	Female	Male	Both Sexes	Female	Male	Both Sexes
Sf	0- 12	306	339	323	409	359	384
Sf	12- 20	43	44	43	67	54	61
Sf	20-100	50	51	51	105	109	107
Sf	100-400	45	57	51	14	17	16
Sf	12-400	136	152	144	185	188	187
Atherogenic Index		54.4	59.1	56.8	73.4	66.8	70.4

Aided by a Grant from the Sophie D. Cohen and William W. Cohen Foundation.

Changes in Thyroid Function During Aging.

B. GRAD, D. L. WILANSKY,* AND M. M. HOFFMAN,* *Gerontologic Unit, Allan Memorial Institute of Psychiatry, McGill University, and the McGill University Clinic, Royal Victoria Hospital, Montreal.*

In old female rats the thyroid had larger follicles and the pituitary showed a greater degranulation of the eosinophils than in young animals, suggesting diminished thyroid function in the aged. This was supported by the higher iodine content per unit thyroid weight of the older animal.

The functional state of thyroid was investigated by the thyroidal I^{131} uptake and release (biologic decay) and found to be about 20 per cent less in the older animals. Furthermore, thyroxine secretion rate was determined by the minimal amount of thyroxine required (a) to antagonize goitrogenic action of thiouracil, and (b) to suppress maximally the release of thyroidal I^{131}. This yielded values of 2.3-2.4 and 1.6-1.8 μg. of l-thyroxine per (100 Gm. body weight)$^{3/4}$ in young and old rats, respectively. Despite this the older rats were not hypothyroid inasmuch as (a) there was no significant age difference in the plasma PBI, and (b) thyroidectomy decreased the basal oxygen consumption to the same extent in both age groups. The aged animals were not less responsive since an equivalent amount of thyroxine had a greater effect on the basal oxygen consumption of the aged rat. The toxic effects of large doses of thyroxine were more apparent in the old as seen by the greater fall in body weight and food intake of this group. The tentative conclusion from these findings was that the reduction of the thyroxine secretion rate in the old animal was a homeostatic adjustment to dimin-

ished target tissue requirements or decreased inactivation of circulating hormone.

* Present address: Jewish General Hospital, Montreal, Canada.
This work was the recipient of a Ciba Foundation's Award in 1955, and was supported by a Federal-Provincial Mental Health Grant to the Gerontologic Unit of the Allan Memorial Institute.

Alteration in Human Blood Serum Lipids with Intravenously Injected Lipid Mobilization Factor.

I. J. GREENBLATT, *Messinger Research Laboratory, Beth-El Hospital, Brooklyn.*

Seifter observed that a peptide-like substance isolated from the blood of horses was dialyzable and, when injected into fasted control animals, produced a lipemia with an increase in fatty acids and cholesterol (L.M.F.). The peptides were isolated following the injection of cortisone.

We studied a group of 21 male and female hospitalized subjects who were injected intravenously with L.M.F. obtained from Seifter (Lot No. WY 991) at levels ranging from 1 mg./Kg. to 60 mg./Kg. body weight. The human response to this lipemogenic substance was slight, in that visible lipemia was observed in only 2 cases, in both instances at a just discernible level.

The standard technique was to obtain a fasting blood sample and inject the L.M.F. preparation at a concentration of 30 mg./cc., and then draw blood samples at hourly intervals for 3 consecutive hours. Changes, beyond the experimental variations, were observed in most classes of lipoproteins from S_f 0-400, consisting primarily of a lowering of most of the liproprotein fractions in this class. Cholesterols fluctuated, with a variable response.

Toxic reactions, such as syncope, tachycardia, and mild hypotension were seen at the 40 and 60 mg./Kg. level.

It is suggested the L.M.F. may be involved in the basic mechanisms of lipid transport, as measured by lipoprotein changes following i.v. injections.

Longitudinal Trends in a Senescent Twin Population.

F. J. KALLMANN, M. M. KLABER, L. F. JARVIK, AND A. FALEK, *Department of Medical Genetics, New York State Psychiatric Institute, Columbia University, New York.*

In a New York State sample of over 2000 senescent twin pairs (over age 60), observations on general health status, intellectual performance, and survival have been recorded since 1946. Intra-pair similarities in the given areas have been found to be more pronounced in one-egg than in two-egg twins.

In 1947, a battery of psychometric tests was administered to 127 same-sexed twin pairs. The following tests were employed: Vocabulary, Digit Span, Digit Symbol, Similarities, Block Design, and Tapping. In 1955, the same battery was readministered to those 79 survivors of the original sample who were available for retest. The surviving sample consisted of 36 complete and 7 incomplete pairs. The mean intra-pair differences were found to be consistently greater in two-egg than in one-egg pairs, thus indicating the demonstrability of genetic factors in intellectual performance until a far advanced age.

The mean decline score obtained in this test series was smaller than that observed in cross-sectional studies. According to twin data, intellectual decline in senescence follows a smooth, straight line without marked acceleration, and resembles the decline trends observed in physiologic investigations.

Despite various methodologic difficulties encountered in longitudinal studies of this kind, the twin study method has proved to be an effective tool in investigating complex problems of senescence.

The Aldolase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages.

J. E. KIRK, AND L. B. SØRENSEN, *Division of Gerontology, Washington University School of Medicine, St. Louis.*

Determinations were made of the aldolase activities of homogenates (intima-media preparations) of the thoracic aorta (N=101) and the pulmonary artery (N=84) derived from individuals ranging in age between 3 weeks and 80 years. The measurements were performed by a modification of the procedure described by Lowry and associates (J. Biol. Chem., *207:* 19, 1954). For the aortic samples the following mean aldolase activities were observed, expressed as mg. fructose-1,6-diphosphate split/Gm. wet tissue/hour: 0-9 years, 17.8 mg.; 10-19 years, 11.3 mg.; 20-29 years, 16.9 mg.; 30-39 years, 21.0 mg.; 40-49 years, 23.1 mg.; 50-59 years, 21.4 mg.; 60-69 years, 26.0 mg.; and 70-80 years, 21.2 mg. For the pulmonary artery samples the corresponding mean aldolase values found for the various decades were: 22.2, 17.6, 23.5, 25.9, 23.9, 22.0, 26.4, and 25.0 mg.

A statistical analysis showed that the mean aldolase value (16.1 mg.) observed for the aortic samples from the subjects aged 0-29 years was significantly lower than the mean value (22.2 mg.) recorded for the 30-80 year old individuals ($t=3.02$, $p< 0.01$). In the case of the pulmonary artery samples the difference between the mean aldolase value of 21.6 mg. found for the 0-29 year old persons and the mean value of 23.0 mg. observed for the 30-80 year old subjects was not statistically significant ($t=1.01$).

The investigation was supported by a grant (PHS-891) from the National Heart Institute of the National Institutes of Health, Public Health Service.

A Practical Working Hypothesis about Some (Not All) Geriatric Processes.

M. H. KNISELY, *Department of Anatomy, Medical College of South Carolina, Charleston.*

Multiple pluggings of small blood vessels in many parts of the body over many years are probable factors in aging.

In strict health, erythrocytes are not agglutinated, pass in single file, or at most a double row, through terminal arterioles, capillaries, and venules. Plugging of small vessels never occurs.

During the past 15 years, investigators have seen agglutinated, sludged blood in more than 10,000 sick and injured patients. Many have reported multiple minute (a) embolizations, (b) stasis-like pluggings, and (c) thromboses. These occurred in whites, Negroes, and males and females of all ages.

Each organ of the body is composed of more specific histologic units of structure than are necessary for the

organ's minimal functioning (cf. Meltzer, Science, 25: 481, 1907). Each human kidney, for instance, has about one million nephrons. A person can live with but one kidney.

With each bout of a disease which agglutinates the blood, we can expect some number of arterioles, capillaries, and venules to be plugged for various periods. Some tissues are more susceptible to damage by temporary loss of blood supply than others. Neurones are particularly susceptible, dying within a few minutes after their blood supply is shut off. With each illness, some histologic units probably are destroyed. Consequent to sufficient anatomical loss, some aging should appear.

Mass, long-term experiment: Keep the blood of several consecutive generations of man unagglutinated. Find cheap, safe, effective drugs to do it. Let's see how much of "aging" is postponed, and how much disappears.

Investigations supported by the Life Insurance Medical Research Fund, the Office of Naval Research, and the United States Public Health Service.

Cerebral Arteriosclerosis in Comparison with Senile Brain Disease in the Aging Process.

L. C. LUND, AND R. A. EDWARDS, *Western State Hospital, Hopkinsville, Kentucky.*

As a part of a long range study of aging of the nervous system in the human and in experimental animals (guinea pigs), this preliminary work on the human nervous system is presented. The guinea pig was selected for comparison on account of availability and absence of arteriosclerosis in cerebral vessels in the senile animal. Microscopic changes in the brain of guinea pigs have been reported by Willcox. Behavioral changes in the guinea pig have been described by Rogers.

Ninety-six patients were studied in regard to two diseases which are not uncommon in the aged. In 67 patients the diagnosis was cerebral arteriosclerosis, and in 29 patients the diagnosis was senile brain disease. Fourteen of the cerebral arteriosclerosis patients are deceased; 6 of the senile brain disease patients are dead. All of the patients received drug vitamin therapy. None received any form of shock therapy. Approximately 70 per cent of the surviving patients with cerebral arteriosclerosis and approximately 30 per cent of the surviving patients with senile brain disease were improved. About 50 per cent of these patients remained unchanged. On the basis of clinical impressions by nurses and staff physicians, it seems that cerebral arteriosclerosis responds to treatment better than senile brain disease.

Longevity of Male and Female House Flies.

M. ROCKSTEIN, *College of Medicine, New York University—Bellevue Medical Center, New York.*

As a follow-up study of an early report in which the number of *living flies* was counted at definite intervals of time following emergence, here the number of *dead flies* was counted for males and females of *Musca domestica*, the common house fly, maintained on sugar and water at 80 F. and 50 per cent R.H. At the end of 12 days 13 per cent of the original 330 males and 7 per cent of the original 238 female flies were dead. At this time all males surviving had abraded or no wings and could not fly, but crept freely. All surviving females continued to fly readily and did not lose their wings even at death. At 22 days, 67 per cent of the males and 32 per cent of the females were dead. At 26 days 90 per cent of the males and 46 per cent of the females were dead; from this point on the female death rate accelerated noticeably, so that at 32 days, 97 per cent of the males and 79 per cent of the females were dead. At 34 days this was 99 per cent and 90 per cent for males and females, respectively, with only 4 males and 21 females still living. By the 43rd day all males were dead, with 6 females still alive. These died out gradually with the last female dying on the 49th day. A more recent study confirmed the above, but a concomitant study of flies from the same colony with sugar, water, and whole powdered milk (KLIM) resulted in prolongation of the longevity of females, but not males reared under conditions otherwise identical with those for the flies maintained on water and sugar alone. For a similar number of flies at the outset, females fed KLIM as well as sugar and water lived 14 days longer than those fed sugar and water alone.

Age Changes in the Vision of Guinea Pigs.

J. B. ROGERS AND R. H. SWIGART, *Department of Anatomy, University of Louisville School of Medicine.*

Vision changes in certain families of guinea pigs in the colony maintained for experimental aging studies and the microscopic structure of the eyes of normal and blind guinea pigs will be described. A method of testing these animals for visual losses will be presented. The testing period lasts for about 4 years. Guinea pigs kept on a diet of alfalfa hay, oats, salt water, and cabbage, change food habits with difficulty when more than 3 years old. Young animals can be trained to eat red apples, instead of cabbage, by withholding cabbage for several weeks. It usually takes about a month to starve the young animals into eating apples. After this they will show interest in red apples, displayed in a transparent sack to prevent distraction by sound, movement, or odor. The untrained animals pay no attention to apples; the trained animals eat the apples. When a trained animal disregards the apples, we examine his eyes carefully and most frequently find an opacity in the lens. Observations have been made on approximately 20 animals in the last 5 years. Six of these were blind by clinical examination. Eyes of young and senile animals were studied in serial section after double embedding.

Blind eyes have been found only in senile guinea pigs of 2 of our families. The microscopic pathology most frequently seen is calcium deposits in the lens and iris, with one instance of overgrowth of the cornea with connective tissue.

Aided by a grant from the U. S. Public Health Service and by a grant to the University of Louisville from the Kentucky State Medical Research Commission.

Changes in the Structure of the Cytoplasm in Old Organisms of *Tokophrya infusionum* as Revealed by Electron Microscopy.

MARIA A. RUDZINSKA, *Rockefeller Institute for Medical Research, New York.*

A study on differences between young and old organisms was performed on a protozoan, *Tokophrya infusionum*, by means of light and electron microscopy.

This organism is especially well suited for such a study because of its identifiable life span, a unique feature among protozoa. Young 3-4 days old *Tokophrya* were compared with 10-12 days old organisms.

For the electron miscroscopy study it was necessary to prepare large amounts of young and old *Tokophrya*. The difficulty in obtaining cultures composed only of old organisms was overcome by a special method of eliminating young organisms which appear in the culture after each feeding.

Thin sections through *Tokophrya* revealed that the cytoplasm possesses all the components found in cells of higher organisms. Its major component, the mitochondria, shows a similar structure as described by Palade for mammalian cells. Each mitochondrion is surrounded by a double membrane and the internal structure consists of projections (microvilli) and folds (cristae mitochondriales), but while in mammalian mitochondria cristae are the prevailing structures, in *Tokophrya*, as in other protozoa, microvilli are the dominant structure. In old *Tokophrya* the mitochondria are less numerous, and larger. The intermitochondrial space is packed with microvilli in the young organism, while in the old individual only a few microvilli are present. In the vicinity of mitochrondria often large, irregularly shaped very dense lipid-like bodies may be found in the older organism. The endoplasmic reticulum, which appears in form of vesicles and canaliculi, is well represented in the young organism and very poorly in the old one. Large areas in the cytoplasm of the old *Tokophrya* are filled exclusively with a small particulate about 250 A, which probably represents an accumulation of waste products.

Supported by a grant from the National Heart Institute USPHS # H-1350 (C3).

Urinary Dehydroepiandrosterone (DHA) and 17-Ketosteroid (17-ks) Excretion in the Aged and Its Relation to Bone Density.

H. Schraer,* R. Schraer, and J. Gershon-Cohen, *Department of Radiology, Albert Einstein Medical Center, Northern Division, Philadelphia.*

Urinary DHA and 17-ks excretion levels were measured in 12 men (64-86 years) and 20 women (64-96 years). Bone density measurements of the os calcis were measured from roentgenograms (Brown, W. N., Jr., Proc. Nat. Electronics Conf. *5:* 64, 1949) in 15 of the women. The 17-ks values were depressed from values found for young people in agreement with other investigators. DHA values were also depressed from 3.4±1.8 mg./24 hrs. in young men to 0.5±0.3 mg./24 hrs. in old men, and from 4.0±1.5 mg./24 hrs. in young women (Bray, B. M., and Merivale, W. H., J. Endrocrinol. *9:* 1, 1953) to 0.4±0.1 mg./24 hrs. in old women. The percentage of DHA excreted as 17-ks was approximately ⅓ the value for young people; from 12.1±5.1 in old men and 13.5±6.3 in old women to 34.1±19.0 in young men and 36.3±8.4 in young women.

The bone density values were compared with the 17-ks excretion values. A correlation coefficient of -0.742 was obtained with a slope of -0.045, implying that in older women there is a tendency for those with a higher daily urinary 17-ks excretion to have a decreased bone density. These results will be discussed from the point of view that the aged adrenal is more cortisone-like in action than adrenals of young individuals and that these aged women with higher urinary 17-ks titers may be excreting more corticoids.

* Present address: Dept. of Physics, The Pennsylvania State University, University Park, Pennsylvania.

Longevity in the Rat as Determined by the Rate of Accumulation of Contributory Lesions.

H. S. Simms and B. N. Berg, *Department of Pathology, College of Physicians and Surgeons, Columbia University, New York.*

The life span of an individual is determined by the time required for the onset and development of contributory lesions (or disease conditions) of sufficient severity to produce a moribund state.

The average life span of a large uniform population in a given species, such as the rat, is governed by the rate of accumulation of those contributory lesions to which that species is susceptible. This rate follows a pattern typical of the species and related to the age of the animals.

Reversibility of the Cortisone-Induced Decrease in the Hexosamine-Collagen Ratio of Connective Tissue.

H. Sobel* and Jessie Marmorston, *Institute for Medical Research, Cedars of Lebanon Hospital, and the University of Southern California, Departments of Biochemistry and Medicine, Los Angeles.*

The net rate of deposition of the fibrillar elements of connective tissue exceeds that of the gel-like ground substance in which the fibrils lie. It has been proposed that the progression of this phenomenon might cause or enhance the aging process (Sobel & Marmorston, J. Geront. *11;* 1, 1956). Cortisone causes a breakdown of the hexosamine-containing material in connective tissue while the fibrillar elements are relatively unaffected. According to the above concept, the administration of cortisone would increase the "biochemical age" of the organism. The physiologic equivalence of this phenomenon is found in (1) increased adrenal activity in stress and illness, and (2) the relatively unaltered rate of production of antianabolic steroids with a decreasing rate of production of anabolic steroids with aging. Because of the above, it became necessary to study the reversibility of the decrease in hexosamine-collagen ratio (H/C) following discontinuation of cortisone administration. Cortisone was administered to rats until a 20 per cent loss in body weight was induced. Following this, the cortisone was discontinued and the rats permitted to regain their original weight and to grow. Four skin biopsies were taken (1) prior to cortisone administration, (2) when maximum weight loss was attained, (3) when the original weight was re-established, and (4) when an additional 20 per cent gain in weight had been attained. It was observed that when the decrease in H/C was moderate, the H/C of specimens of group 3 returned to normal and the expected value was found in specimens of group 4. When the H/C decreased greatly, the values of H/C in specimens of group 3 and 4 were below normal. These studies may have some bearing on the permanency of the effect of previous catabolic situations on age.

* Investigator, Howard Hughes Foundation.

Recent Findings in Gerontologic Studies of the Golden Hamster (*Mesocricetus auratus*, Waterhouse).

A. L. SODERWALL, H. A. KENT, AND C. L. TURBYFILL, *University of Oregon, Eugene.*

General observations of abnormal tissue growths and their relative frequencies among the older and senescent animals have been accumulating significantly.

In a broader study on the physiology of reproduction in normal adult and senescent golden hamsters, it has been increasingly apparent that associated with an overall decline in reproductive capacities in the aged animals, neoplastic types of tissue growths make their appearance in a high percentage of both males and females.

No tissue seems exempt from this phenomenon, particularly those in the abdominal organs and systems. Typical among such overgrowths are the following: a) polycystic, serous, and hemorrhagic ovarian follicles, b) testicular hypertrophies, c) polycystic and nutmeg livers, and d) hypertrophied adrenal glands.

From the physiologic point of view, senescent hamsters, which were subsequently found to be harboring enlarged adrenal glands, consistently imbibed a greater water intake relative to normal animals. Their water intake was 5 times as much. The voided urine likewise was of greater quantity, pale, and of a watery thin consistency.

Microscopic studies of those adrenals reveal a markedly enlarged cortex. The suggestion is offered that the output of adreno-corticoids, such as desoxycorticosterone, might account for the altered urine volume and consistency. This would be in line with experimentally produced polyuria following the administration of desoxycosterone in excessive quantities. Slides will be shown to illustrate this phenomenon plus kidney involvements associated with it.

Supported by Grants G-4213 and G-4473, National Institutes of Health, U. S. Public Health Service.

Comparison of Blood Viscosity Changes in Old and Young Rats.

J. W. STILL, *Department of Physiology, George Washington University School of Medicine, Washington, D. C.*

Extensive studies of blood viscosity in young rats have demonstrated that this blood factor is subject to acute changes in response to a wide variety of stimuli,—pain, epinephrine, heat, cold, etc. There is also a considerable variability between different animals of the same age. For example, the response in blood viscosity to pain may vary from zero to a marked change. The present paper is an analysis of changes in blood viscosity in older animals as compared with younger groups. Differences in change in response to stimulation and in recovery rate are presented.

Biologic Characteristics of the Aging Process Affecting Litter Spacings in Mice.

L. C. STRONG, *Biological Station, Roswell Park Memorial Institute, Springville, New York.*

Six maternal age descents are being continued from a cross between mice of a polydactylous descent and C_{57} blacks. So far, the derived hybrids have reached the 16th generation of inbreeding from the F_1. The descents are, in sequence, less than 100; 101-200; 201-300; 301-400; 401-500 and 501-600 days, depending upon the age of the mother at the time the offspring are born. The ages of first litters are, in sequence, for these 6 descents, 76.2 73.9; 72.7; 69.3; 71.6; and 51.5. The average litter spacings for the first 7 litters are, in sequence, 28.2; 27.7; 27.0; 26.2; 26.0 and 26.8. The average litter spacings between the 8th and 14th litters are 22.5; 23.9; 25.2; and 26.7. (No data available between 501-600). The average improvements in litter spacings, therefore, between litter 1 to litter 8 and litter 9 to 14 are, in sequence, -5.7; -3.8; -1.8; -1.7 and $+0.7$. The average ages of females at the time their 14th litters were born were, in sequence, 408.6; 411.5; 412.7; 399.3 and 412.8 (no data available for class 501-600). Thus the early litter descent mice have their first litters later than do mice of the older age groups; they have a higher average litter spacing between the F_1 and F_8 than do females of the other groups but they improve more in their later litters. All descents have their 14th litters at about the same age. These observations are based upon 85,000 mice belonging to about 12,500 litters. Thus variation seems to take place counter to the trend of selection. These data indicate that there is a compensatory mechanism, probably for the purpose of keeping a species in equilibrium. The nature of this compensatory mechanism is unknown but it is obviously associated with the aging process of the individual. A discussion of a possibility of a correlation between Mendelian segregation and the aging process of the individual is included in the discussion.

Respiratory Enzyme Variations in the Aging Periosteum.

E. A. TONNA, *Department of Biology, Graduate School of Arts and Science, New York University, and Hospital for Special Surgery.*

Cytochrome oxidase and succinic dehydrogenase activities were studied histochemically in an attempt to obtain answers to two questions: (1) Why does bone formation and growth proceed with rapidity at a younger age, and then there follows a great reduction in this rate at a particular time? (2) Why is there a tendency for bones of older animals to mend at a reduced rate?

One hundred male and female rats of a modified Long-Evans strain were used at the following ages: 12 days, 5 weeks, 8 weeks, 6 months, and over 1 year. Frozen sections were made from the mid-femoral region of the legs.

The osteogenic layer of the periosteum revealed the greatest enzymatic activity. Twelve day-old animals revealed strong activity of both enzymes, although the reactions were also intense in the 5-week-old animals. This age span corresponds to a period of maximal bone formation. Eight-week-old rats exhibited a critical drop to practically zero in the activity of both enzymes. The periosteum of the remaining age groups showed essentially no activity.

It seems that in the process of bone formation, respiratory enzymes are involved, probably secondarily, and that their probable localization in the mitochondria indicates an important relation between these sub-

cellular particulates and the growth and formation of bone. The sharp drop in activity in 3 weeks' time is believed to be due to the rapid aging process of the osteoblasts. This process is probably the consequence of the intense osteoblastic activity prior to 8 weeks of age. The problem of bone aging does not seem to be due to a reduction in the number of osteoblasts, since in 8-week-old periosteum osteoblasts are as numerous as in 5-week-old periosteum, yet the respiratory enzymes drop to practically zero during that time. It may be said that the process of bone formation in the rat actually attains old age at 8 weeks after birth.

Age and Oxidative Phosphorylation in Rat Liver and Brain.

E. C. Weinbach and J. Garbus, *Laboratory of Tropical Diseases, National Institute of Allergy and Infectious Diseases,* and Section on Aging, National Institute of Mental Health,* Bethesda.*

Although oxidative phosphorylation is generally regarded as the primary mechanism in aerobic cells for the generation of ATP, the scanty literature relating aging and enzymatic activity does not contain any systematic study of this important exergonic mechanism. In this paper we report studies of oxidative and glycolytic phosphorylation in cell-free preparations of rat liver and brain obtained from Sprague-Dawley rats of advanced age (greater than 22 months) and mature young adults (3-8 months). Both substrate oxidation and coupled phosphate uptake were 30 per cent less in isolated liver mitochondria of the aged rats when compared with the activity found in young controls, but the P:O ratio remained unchanged. On the other hand, anaerobic glycolysis and its associated phosphate uptake did not decline in liver preparations from the older animals.

In contrast to these findings, no differences were observed between the young and old groups in respect to oxygen consumption and coupled phosphorylation in fortified brain homogenates.

The implications of these findings with respect to cellular metabolism in senescence will be discussed.

* National Institutes of Health, United States Public Health Service, Department of Health, Education and Welfare, Bethesda, Maryland.

A Quantitative Study of Purkinje Cells in Guinea Pigs.

H. H. Wilcox, *Department of Anatomy, University of Tennessee Medical Units, Memphis.*

The Purkinje cells of the guinea pig seem to be much more stable than those in other species. Most of the cytologic alterations described as accompanying the aging process in the human and experimental animals are rarely encountered in this form. A study of the brains from a series of guinea pigs, whose ages varied from 139 to 2765 days, has shown that the only constant cytologic alteration is the accumulation of a lipofuscin pigment in the cytoplasm. This pigment occurs quite constantly in the Purkinje cells of animals older than 4 years (1460 days).

No deterioration or loss of the Purkinje cells was apparent and a quantitative study indicates that there is no real difference between animals of different age groups. Using a Whipple disc micrometer and a constant lens combination, a .22 mm. strip of cerebellar cortex could be accurately measured and the Purkinje cells in that strip were counted. Counts were made on a minimum of 80 such strips in each animal. Care was taken to confine the sampling to comparable areas of the cerebellum. Sixteen animals of this series were younger than 4 years of age. The number of Purkinje cells in the measured strips of cortex from the members of this group averaged 11.10 ± 0.5559 (standard deviation), the range of their means being from 10.00 to 12.28 per strip. The older group of 10 animals, whose ages were 4 years or older, had a mean of $11.44 \pm .5040$, with a range of their means from 10.20 to 12.54 per strip.

No significant difference between the numbers of the Purkinje cells in the animals of these 2 groups can be demonstrated. A graphic presentation of this data indicates a random sampling of a normal population.

Supported by contract SA-43-ph 789 between the University of Tennessee and the National Institute of Neurological Diseases and Blindness, NIH, USPHS.

Age Changes in the Chemical Composition of Muscle and Liver in the Rat.

M. J. Yiengst, C. H. Barrows, Jr., and N. W. Shock, *Gerontology Branch, National Heart Institute, Bethesda, and the Baltimore City Hospitals, Baltimore.*

A comparison of age changes in the composition of muscle, a fixed post-mitotic tissue, and liver, a tissue which retains mitotic potential, has been made in 40 virgin albino rats. All animals were reared under standard conditions. Twenty young animals, aged 12-15 months (10 males and 10 females), were compared with 20 old, aged 24-27 months. No significant age changes were found in total water. fat, K. or Na content of liver.

In muscle, the total water content was 76.0 per cent in both old and young animals. Extracellular electrolytes (Na, Cl) increased significantly ($P > .001$) in the old males. Females showed similar but less significant ($P > .05$) changes. Extracellular space, calculated from Cl, increased from 15.6 per cent of the total water in the young to 19.7 per cent in the old animals. Since total water remained constant, this represents a decrease in the intracellular space.

Intracellular components (N, K, and P) decreased significantly in the old animals ($P > .001$ in males; $P > .05$ in females). Because of the proportional diminution of N, K, P, and water, a loss or atrophy of cells rather than intracellular dehydration is indicated.

The results are compatible with the concept that aging is accompanied by a loss of cells that are replaced by extracellular components in fixed post-mitotic tissues in contrast to tissues which retain regenerative potential.

SECTION ON CLINICAL MEDICINE

Problems of the Mind in Later Life: A Film Report.

J. B. CHEWNING, *William S. Merrell Co., Cincinnati.*

Views of 7 physicians on mental and emotional problems in later life were presented at a 1956 Symposium on Constructive Medicine in Aging. A motion picture record was made using new high speed film. Filming was done without the benefit of bright lights, and speakers and audience were not distracted by this technique of filming.

Capt. George N. Raines, M.C., head of the Navy Department of Neuropsychiatry, and Dr. Edward J. Stieglitz, Washington, D. C., reviewed the significant points presented at the Symposium. The film thus becomes a documentary of one important meeting on aging. Filmed sequences punctuate these points discussed in retrospect by Drs. Raines and Stieglitz: (1) Magnitude of the problem of mental and emotional illness in later life, (2) attitude of society, patients and physicians toward emotional disturbance, (3) relation of psyche and soma in dealing with such problems in the aging and aged, (4) constructive attitude toward anticipation, prevention, or alleviation of mental illness.

Comments on film by Drs. Karl Bowman, Franklin Ebaugh, Ewald Busse, Freddy Homburger and Edward Weiss are used in the discussion of the above 4 points.

The film is presented as an experiment in medical communication.

Osteoporosis in the Aged: Radiographic Survey and Biochemical Correlations.

L. GITMAN, T. KAMHOLTZ, AND J. LEVINE, *Brooklyn Hebrew Home and Hospital for the Aged, Brooklyn.*

Approximately 200 aged individuals were surveyed radiographically and the findings listed according to a predetermined standard coding system. Pertinent clinical information and biochemical data were also codified. This information was entered on Keysort cards which were used for the various correlation studies reported.

On the basis of this initial study, the following conclusions seem warranted:

1. The incidence of significant osteoporosis radiographically is higher in females than in males.

2. The incidence of significant osteoporosis in the female increases with age. The incidence of negative or equivocal findings is reciprocal.

3. The incidence of significant osteoporosis in males rises from the 65-70 age group to reach a peak at the 81-85 years group and then falls in the 86-90 group. The latter, however, may be because of the fact that the total number in the group is small. The incidence of negative or equivocal osteoporosis is approximately the same for all age levels in the male.

4. There seems to be no significant correlation between the incidence of Grade 4 osteoporosis and the state of ambulation.

5. The incidence of decreased body weight is greater in those patients showing Grade 2 to Grade 4 osteoporosis compared to those patients showing equivocal or no osteoporosis.

6. There is no significant correlation between degree of osteoporosis and the level of serum calcium, alkaline phosphatase, acid phosphatase, hemoglobin, total protein, albumin, globulin, serum phosphorus, and urea nitrogen.

7. There was no correlation between the presence of back pain and the degree of osteoporosis.

Serum vitamin A levels and thyroid uptake of radioactive iodine were studied in a selected group and the results correlated with the degree of radiographic osteoporosis.

The Use of Ritalin in Treating Depressions of the Aged.

A. JACOBSON, *Asbury Park, N. J.*

A pilot study was undertaken to investigate the effectiveness of Ritalin in the treatment of patients in the sixth and seventh decades who were receiving psychotherapy for depression. This included both reactive and involutional depressed groups. A control group was maintained. A total of 54 patients were studied; all were ambulatory and considered fair to good extramural risks (i.e., suicide was not believed an imminent risk). The need for the study was believed important because of the difficulties generally in dealing with an uncooperative depressed geriatric patient. The search for an aid in reducing the depression and enlisting the patient's cooperation has been a long one in both psychiatry and geriatrics. Patients receiving Ritalin generally were more cooperative with psychotherapy and other social management than those receiving a placebo. Several case histories are presented. The use of the drug in combination with ataraxics is discussed. Further studies appear warranted with this promising drug.

Management of Peripheral Arterial Disease in the Aged.

SAUL S. SAMUELS, *New York City.*

The paper will briefly describe the various types of peripheral arterial diseases found in the aged together with a simple method of arriving at a diagnosis and estimating the prognosis. Detailed discussion of the treatment of the ambulatory patient, the proper handling of impending gangrene, and the treatment of gangrene by conservative methods will be presented. Indications for amputation and recommended technique of amputation which has given the lowest mortality will be discussed. The contents will be based upon thirty years' experience in this field.

The Influence of Oral Insulin Substitutes (the Sulfonyl Ureas) on Thyroid Function of Older People as Measured by I^{131} Uptake.

W. SEEGERS, T. H. MCGAVACK, AND V. ERK, *New York Medical College, Metropolitan Research Center Unit, New York.*

Because of their hypoglycemic action, two aryl sulfonyl ureas (Carbutamide and Tolbutamide) may be subjected to exclusive use in the management of diabetes mellitus. Inasmuch as the first named of these two compounds is a sulfonamide and the second lacks the sulfonamide structure through the substitution for

the NH^2 of a methyl group for the amide group in the para position on the benzene ring, it seems wise to test thyroid function of patients subjected to therapeutic dosage. Radioactive iodine uptakes have been ascertained in 44 patients following the usage of one of the sulfonylureas in doses of 1 to 4 Gm. daily for periods of time varying from 1 day to 9 weeks. The subjects ranged in age from 57 to 89 years with an average of 71.1 years. In this older group of patients it was found that the immediate uptake gradient following a 4 Gm. dose was significantly depressed in some of the patients receiving Carbutamide. After 4 days of 4 Gm. daily, Carbutamide caused a highly significant depression of I^{131} uptake by the thyroid while Tolbultamide showed a similar but not statistically significant trend. I^{131} uptakes were also performed at the end of 2 and 9 weeks following maintenance doses of the drugs varying from 1 to 2 Gm. daily and also after patients were off the drug for periods of time varying from 5 to 9 weeks. There was no significant trend at the end of two weeks of therapy, but at the end of 9 weeks there seemed to be some depression of I^{131} uptake in both groups of subjects, more marked with Carbutamide than with Tolbutamide. Those subjects whose radioactive iodine uptake was depressed while on the drug showed change towards normal at the end of 5 weeks off the drug. After 9 weeks off the drug, the uptakes seemed to be the same as in the control tests.

The Treatment of Older People with an Estrogen-Androgen-Thyroid Mixture.

W. Seegers, H. Haar, Maria Krawzoff, J. Enzinger, and T. H. McGavack, *New York Medical College, Metropolitan Research Center Unit, New York.*

It is commonly said that estrogen, androgen, or thyroid, or some combination of any or all three, improves the general condition of older people. However, there are very few studies which have put such statements to carefully controlled trial in men and women. In a study which includes more than 60 subjects, a mixture containing methyltestosterone 2.5 mg., ethinyl estradiol 0.01 mg., and desiccated thyroid substance ¼ gr. has been given in doses ranging from 2 to 4 tablets daily. Some of these subjects have been selected for special metabolic studies. In the men of this group, 2 tablets daily caused an average increase in nitrogen retention of 1.1 Gm./day. When 4 tablets were given, there was an average increase over the control values of 2.3 Gm./day, while similar figures for women showed an average change of 1.5 Gm./day and of 2.4 Gm./day, respectively.

Urinary 17-ketosteroid excretion was depressed in the experimental periods in the men only. Changes in basal metabolic rate have not been remarkable. Serum protein bound iodine values will be reported. Serum cholesterol and protein values showed slight downward alterations. Blood urea nitrogen and creatinine, albumin globulin ratio, sedimentation rates, and free cholesterol were not materially changed. Simple psychometric and activity tests were performed in all patients. There was a significant trend toward improvement in over-all activity, in memory and in other simple psychologic performances in a majority of patients. Subjective improvement was also present in a high percentage of the cases. Attempts will be made to grade quantitatively the psychologic and subjective responses.

The Detection of Uterine Cancer in Women after Sixty.

J. R. Wolff and H. Ganzer,† *Cancer Prevention Center, Chicago.*

It is well recognized that the key to the control of uterine cancer is early diagnosis. Screening and diagnostic methods in use today give us the ability to make a true early diagnosis. Cytologic studies of vaginal pool and cervical secretions, biopsies, endometrial scrapings and smear evaluation, and the encouragement of regularly repeated pelvic examinations in apparently healthy women are of tremendous value in detecting early carcinoma. Yet our experiences at the Cancer Prevention Center of Chicago show that we have not reached the optimum in geriatric patients.

A survey of apparently normal women 60 years of age and over who came to the center for a routine health survey reveals a high incidence of uterine cancer. The essential reasons for this high incidence may be directed to both patients and physicians.

It was found that women past the menopause are too complacent, apparently feeling that once this stage of life has been reached they are no longer vulnerable to serious pelvic pathology. They become accustomed to minor pelvic disorders and tend to disregard important symptoms. They do not continue with advised yearly examinations and often seem reluctant to accept treatment when symptoms are at a minimum.

This survey shows that the physician is not as uterine-cancer-minded as he might be in his care of geriatric women. Simple pelvic examination too often is neglected, yearly health surveys are not encouraged, and thought is not given toward eliciting pelvic symptomatology. Present day cancer screening methods are not as yet in routine use.

Both physician and patient must be made aware of this low incidence of early uterine cancer and the high incidence of advanced uterine cancer in geriatric women.

---

* Assistant Professor Obstetrics-Gynecology, University of Illinois.
† Instructor Obstetrics-Gynecology, Chicago Medical School.

SECTION ON PSYCHOLOGICAL AND SOCIAL SCIENCES

Informal Social Relationships in a Retirement Community.

G. J. ALDRIDGE, *Michigan State University, East Lansing.*

During a study of the social aspects of aging in a small retirement community in central Florida, it became evident that informal social participation was of even greater importance in this setting than participation in the activities of formal organizations.

It was recognized that considering formal and informal social participation separately was essentially a device, since they are inextricably interrelated. Members of a formal organization often have informal social relationships with other members. Other persons may move into a formal organization because of club members with whom they have informal social relationships.

For all older persons in this community informal participation was important, and for almost half it represented their only form of social relationships. Informal social participation was achieved through such activities as reading, radio listening, gardening, card playing, sewing, and fishing. Often participants would tend to develop cliques around such activities, sometimes on a neighborhood basis and almost always comprising only older persons. Other informal relationships did not necessarily have the stability or continuing nature of the foregoing. Such floating social contacts were typical of the Post Office, shopping trips, eating places and, especially, the downtown green benches.

These various informal social relationships seemed to be important to older persons because of their flexibility, lack of "red tape" regulations and requirements, low (if any) cost, and the support and social recognition received by the participants. For about half of the community's older people such relationships complemented those stemming from participation in formal social organizations. For the remaining older persons who were unable or unwilling to participate in these organizations, informal social relationships provided acceptable social outlets.

The Use of Light Aversion Motivation in Studies of Aging in Rats.

J. BOTWINICK, J. E. BIRREN, E. A. JEROME, *Section on Aging, National Institute of Mental Health,* Bethesda.*

One problem related to studies of learning and other types of performance in animals of different ages is the equivalence of the motivating conditions. It is possible, for example, that three days of food deprivation may have different motivational strength for older and younger rats. There is also the issue of the rapidity of satiation of the motivating circumstances.

To circumvent the need to manipulate factors such as food and electric shock, a relatively new technique was employed with young and aged rats. Light aversion was used in this study. In the experiment, rats could avoid light by crossing a barrier into a dark chamber, darkness being the only reward. High work levels (many crossings) were maintained by food and water satiated animals in an environment similar to the laboratory cages.

Forty-eight Sprague-Dawley rats, 24 males and 24 females divided into groups of 1 and 2 year old rats, were run to determine whether light aversion was a suitable technique for studies of rat aging. The data were analyzed with respect to time required for first crossings, frequency or rate of crossings, latency of crossings and apparent "fatigue" due to continued crossings.

The data on age group comparisons and the details of the technique will be described. The technique, while with limitations, holds promise for being particularly suitable for psychologic studies of aging in rats.

* National Institutes of Health, United States Public Health Service, Department of Health, Education and Welfare, Bethesda, Maryland.

Patterns of Social-Role Performance in Relation to Aging.

R. J. HAVIGHURST, *Committee on Human Development, University of Chicago.*

The purpose of this study was to find out what patterns of social role performance exist in a sample of people aged 40-70 and how these patterns are related to aging and to personal adjustment.

Performance in 9 social roles was rated reliably by 2 judges on the basis of a 2-hour interview with 124 women and 110 men. The sample was stratified so as to secure approximately equal numbers in the following 4 socio-economic groups as defined by Warner: upper and upper middle (combined), lower middle, upper lower, and lower lower. The 9 social roles about which the interview centered were: parent, spouse, homemaker, worker, friend, citizen, club and association member, church member, and user of leisure time.

The question to be answered by pattern analysis was: what combinations of performance in the 9 roles are characteristic of people, and how are age, socio-economic status, sex, and personal adjustment related to the various patterns which are found to exist? The pattern analysis consisted of a comparison of each person in the sample with every other person and a sorting out of the people who had similar profiles of performance scores. In this way a total of 26 patterns was discovered, ranging from 8 to 34 members. These patterns fell into 5 large groups which were characterized by differences in socio-economic status, personal adjustment, and complexity of life-style.

There is not much relationship of age to pattern of role-performance, although several of the "family-centered" patterns are characteristic of people under 60. In general, it appears that a pattern or style of role-performance is established by middle-age and persists well into the sixties at least.

A Pilot Study in the Comparison of the Morale of Older and Younger Employees.

MARGERY J. MACK, *Mental Health Consultant, Social Science, Chicago Regional Office, DHEW-PHS, Chicago.*

The Employee Inventory, developed by the Industrial Relations Center, University of Chicago, is an instrument designed to measure the morale of employees. In order to determine the association, if any, of age with

morale, a question on the age of the employee was added to the Inventory when it was administered to the employees in one company. The findings indicate that older workers, on the average, have higher scores on morale than younger workers. The comparative data on a number of items are of especial interest. The influence of other factors on morale, besides age, are discused.

A Study of Age Changes in Adult Sex Roles.

BERNICE L. NEUGARTEN AND D. L. GUTMANN, *Committee on Human Development, University of Chicago.*

In studying male and female roles in the family as seen by adults aged 40 to 70, findings are based upon 114 cases drawn from the extensive non-clinical population used in the Kansas City Studies of Adult Life. The sample includes men and women of 2 social status groups, upper-middle and upper-lower classes.

The instrument was a specially designed TAT card showing 4 figures: an old man, an old woman, a young man, and a young woman. Protocols were analyzed "blind" for age and social class. Descriptions of the old man and old woman were grouped according to similarity; and the resulting distributions were checked for statistical significance.

Results: Role descriptions were found to vary significantly with age of respondent, although not with sex or social status. The old man is seen in terms of uncritical affiliation, identification with the needs of others, and denial of interpersonal intrusiveness. Younger respondents (aged 40-54) see him as one who exercises some measure of intrafamilial authority; but older respondents (aged 55-70) see him as the object of aggressive domination by his wife, whose only action mode is to "think," and who has no effective familial role.

The old woman is seen in terms of the need for intimacy and for unlimited control over the interpersonal environment. Younger respondents see her as one who has a submissive familial role; but older respondents see her as wielding unilateral control over the family and as increasingly aggressive in implementing her needs.

Conclusions: While these role descriptions are partly artifacts of the projective process, the age shift is undoubtedly based upon changes in real behavior. The implication is that deep-seated psycho-sexual development occurs in late adulthood, development which follows a different pattern in men than in women.

Progress of Aged Psychiatric Patients in Relation to Diagnosis and EEG Findings.

W. D. OBRIST AND C. E. HENRY, *Institute of Living, Hartford, Connecticut.*

A follow-up study was made of 103 aged psychiatric patients who were hospitalized between 1 and 2 years ago. The patients, ranging from 65 to 95 years, were classified according to the outcome of their illness, as follows: 1) continued hospital care, 2) transferred to a convalescent home, 3) discharged to the family, and 4) deceased. When related to psychiatric diagnosis, the outcome of these cases was found to be quite similar to those studied by Dr. Martin Roth in England. Although the number of cases is small, several statistically significant trends were observed.

One-third of the patients with organic brain disease (senile deterioration) had died at the end of 1 year and another third required continued hospitalization. Only 13 per cent were able to go home. In contrast, half of the patients with minimal evidence of deterioration (primarily affective reactions) had returned to their families and another quarter were living in convalescent homes.

With respect to the EEG findings of 1 year ago, a very similar trend was observed. Two-thirds of the patients with moderate or severe abnormalities (diffuse slow waves) had either died or remained in the hospital. Only about 14 per cent went home. In comparison, half of the patients with normal EEGs returned to their families and a third more were in convalescent status. The few cases with strictly focal EEG abnormalities (mostly temporal lobe) followed a pattern similar to those with normal tracings.

These results lend support to the conclusions of Dr. Roth, and suggest that EEG findings may also have prognostic significance in aged psychiatric cases.

Sex and Social Class Perspectives on the Stages of Adulthood.

W. A. PETERSON, *Community Studies, Inc., Kansas City, Missouri, and* BERNICE NEUGARTEN, *Committee on Human Development, University of Chicago.*

The social psychology of adulthood deals, in considerable part, with the manner in which persons adjust to, or deviate from, expectations regarding age-appropriate behavior. This is a study of the American age-grade system, in terms of how respondents define and view the age-geared periods and processes characteristic of the adult phase of life. The analysis is based upon extensive interviews with a sample of 240 men and women aged 40 to 70, residing in a metropolitan area, drawn from 4 social class categories (upper-middle to lower-lower).

Results are discussed in terms of sex and social class differences in descriptions of the aged periods, the personal and social events which mark the transition points, and the psychologic themes which characterize each age period. Illustrative findings are:

For the sample as a whole, adulthood (age 21 onward) is seen as being divided into 3 age periods: one ending at 30, one at 40, one at 60.

Middle-class men, compared with lower-class, respond consistently in terms of a longer period (5 to 10 years longer) of activity and productivity in adult life. The tendency among middle-class men is to divide the periods at 30, 45, and 65; among upper-lower class men, at 30, 40, and 60; among lower-lower class men, at 25, 35, and 50.

Middle-class men describe the periods of life in terms of occupational career, with emphasis on hard work and striving in young manhood, a prime of life at 45, and a reaping of rewards for many years thereafter. Working class men portray the game of life much less in occupational terms, somewhat more in terms of family changes, and considerably more in terms of physical vigor. The major rewards for working class men are placed in young adulthood.

Some of the same class differences appear among the women, but all women place much more emphasis on age 40 as the critical division point in the adult period.

The significant theme appearing in women's descriptions is that of 2 relatively disconnected sequential lives, 1 before and 1 after 40.

The paper will discuss the implications for understanding psychologic and social development in adulthood.

Adult Education for the Aging—Its Limitations.

W. H. REALS, *Washington University, St. Louis.*

All adults, at any age, can profit from continuing their education but to realize the greatest profit, education for the later years comes too late.

What we are when young determines to a large extent what we are when old. The habits developed in childhood and youth are carried over into old age. We develop, as a rule, few new interests late in life. Those not interested in early ages in good reading, good music, and wholesome recreation do not easily develop them later. One's early environment and the school have a predetermining influence which carries through to the end of life, and, therefore, to be most effective the school must consider preparation for all of life, not only the years of childhood and youth.

Our various polls show us that 57 per cent of our high school graduates have not read a book in a year, slightly more than one-half of our eligible voters vote, even the teachers do not show a very good record in this regard, and most persons are spectators rather than participants in recreational activities. If proficiency and satisfaction are not acquired so that they function in early adulthood, adult education in the later years is handicapped.

The Relationship of the Halstead Impairment Index and the Wechsler-Bellevue Total Weighted Score to Chronologic Age.

R. M. REITAN, *Department of Surgery, Indiana University Medical Center, Indianapolis.*

This investigation was conducted in order to determine the relationship of chronologic age to the Halstead Impairment Index and Wechsler-Bellevue total weighted score. After complete neurologic examination, the subjects were divided into 2 groups: Group 1 consisted of 190 with unequivocal evidence of brain damage, and Group 2 comprised 116 with no clinical or anamnestic evidence of brain damage.

The complete W-B scale and Halstead's neuropsychologic battery were administered to each subject. The Halstead Impairment Index and the full-scale W-B weighted score (unadjusted for age) were obtained. The 2 groups were combined to form an equivalent T-score scale for each variable. Mean T-scores for individuals in each 5-year age interval (from 20 to 65 years) were plotted for each group. Correlation between age and test results were computed.

In each 5-year interval the group without brain damage obtained a better mean than did the brain-damaged group on both variables. The intergroup T-score differences were generally larger for the Impairment Index than the W-B total. Correlations between age and W-B total for the brain-damaged and non-brain-damaged groups were .37 and .35, respectively. For the groups with brain damage, age and Impairment Index correlated .37, but the correlation between these variables for the group without brain damage was .60. Statistically significant deviation from rectilinearity of relationship was approached in this last instance.

The results will be compared with those obtained by others and their possible significance concerning changes in brain functions associated with aging will be noted.

The Older Worker in Business and Industry.

A. SALAMONE. *Adult Education Center, St. Louis University, St. Louis.*

Healthy, capable workers who have been denied jobs merely because of their age pose one of the greatest problems facing our society today. Business leaders have a moral responsibility to their communities, not only to retain but to hire such workers.

A large factor in the discrimination of older workers is the continued growth of pension plans in these postwar years. The prepaid pension and medical plans usually bar older workers, or make the premiums for them so high employers are not willing to hire them.

Older workers, if united, could pressure the passage of legislation prohibiting age discrimination. But discrimination can only be removed by a change in public attitude.

Business must realize that what is good for business is not always good for the community, but what is good for the community is good for business.

Continued employment is necessary for an individual's well-being. Employment is a source of prestige and recognition, a basis for self-respect, a place for social participation, a source of creative self-expression, and a way of making time pass.

It is inconsistent that we Americans are spending vast sums of money and scientific ingenuity to lengthen our physical lives on the one hand and arbitrarily cutting our social and economic lives shorter and shorter on the other.

There are more than 1,500,000 workers 65 years of age and over who are both physically and mentally capable of working, but who are denied work because of their age. Retirement is the greatest man-made problem we have today.

The problem of employment for older workers is being discussed in many ways and by many groups, but it is not being discussed effectively by those who can best do something about it—the policy making leaders of management.

This paper will discuss the project "To Develop a Climate and Create Employment Opportunities for the Older Workers" undertaken by the writer for a 6-month period, in cooperation with the Missouri State Division of Employment Security and the Bureau of Employment Security, U.S. Department of Labor.

Behavioral Rigidity as a Central Concept in the Analysis of Age Changes in Adult Behavior.

K. W. SCHAIE, *University of Washington, Seattle.*

Recent work with the psychologic concept of "behavioral rigidity" has raised interest in using this concept as a central mediating factor. The present paper discusses implications of applying the concept to the analysis of adult age changes in human behavior. Two models are suggested: 1) If the "disease" theory of aging holds, then one would expect the more rigid person to have greater difficulty in adjusting to the stress he is

exposed to and show earlier decline, whereas if 2) the "maturational" view of decline be true, then such decline should be a function of initial level of ability for both flexible and rigid populations.

Experimental evidence supporting the second model is discussed, based on a cross-sectional study of the relations between Thurstone's Primary Mental Abilities and Schaie's Test of Behavorial Rigidity for successive samples in 5-year age intervals from a group of 500 adults aged 21-70 years.

Psychopathologic Investigation of the Senile Psychosis.

J. SHEPS, *New York City.*

The usual subsidence of acute senile psychosis in mental institutions and the occurrence of "admission" psychosis in homes for the aged point to the importance of anxiety from maladaptation to complicated or new situations.

Paranoid personalities in the aged, in contrast to younger groups, form a psychotherapeutic relationship consistent with the degree of organic disorganization providing communication is possible.

Applying Bender's work on the disturbance of spatial and temporal organization in cerebral incompetence, Weinstein and Kahn demonstrated that the incompetent brain permits a disordered symbolic perceptual pattern of organization seen occasionally in the normal state in poetry and humor. The adaptive meaning of the psychopathology was an attempt to resolve the threatening situation of the serious illness, disability, and death.

The importance of these concepts in understanding the symptoms of senile psychosis is outlined. The plea for help that paranoid personalities cannot express openly is the common factor.

Management of these cases includes understanding of the denial of the fears of chronic disability, dependency, and death. The aid of the children or social agency in fulfilling the dependency needs and simplifying the environment has been instrumental in reducing adaptive tasks sufficient to the capacity of the incompetent brain. Anxiety and consequent maladaptation, the symptoms, are relieved. Illustrative cases are cited.

Rorschach Patterns of Normal and Senile Aged Persons Contrasted with Young Groups and Interpreted within Three Personality Theories.

MARGARET THALER, *Walter Reed Army Institute of Research, Washington, D.C.*

Two procedures were employed in this study. Rorschach responses from a group of normal aged persons living independently in the community were contrasted with those from a group of newly hospitalized "senile" persons with similar backgrounds. Each group was compared with normative values reported in the literature for groups of younger adults.

Secondly, Rorschach scorings were consistently defined within constructs from 3 personality theories, those of psychoanalysis, Goldstein, and Lewin. The Rorschach patterns of the 2 aged groups were interpreted within each of these personality frameworks.

There were few significant differences between the Rorschach patterns of the community group and normative values expected in groups of younger adults. However, there were vast differences between the senile group and the other 2 groups.

The psychoanalytic definitions offered 5 criteria of ego functioning (regulation of perceptual activity, motor discharges, memory, reality testing, and synthesizing functions), plus dynamic content analysis as the framework for viewing personality characteristics of these aged persons.

Goldstein's theory ordered the data within the concepts of figure-ground relationships, concrete-abstract attitudes, and ordered-catastrophic behavior.

Lewin's concepts offered personal regions, barriers, and locomotion; level of aspiration, regression and the concept of the person.

The findings revealed that a group of adequately functioning older persons shared many Rorschach paterns with groups of younger adults, while records from a group of senile persons differed significantly. The 3 personality theories used to interpret the findings offered useful hypotheses for evaluating personality functioning in groups of aged subjects.

Morbidity of Older People in Relation to Social-Class Position.

I. L. WEBBER, *Institute of Gerontology and Department of Sociology and Anthropology, University of Florida, Gainesville.*

This paper presents an analysis of the relationship of social-class placement to incidence of disabling illness and patterns of health care for 1,278 individuals aged 50 and over. The data were obtained through interviews with informants in households located in 4 counties and 1 metropolitan area in central and northern peninsular Florida. The cases in the counties, while not necessarily statistically representative, were selected by a random method; those in the city constituted a directed, nonproportional sample of middle- and lower-class persons. Social-class position was inferred from the rating on a 5-point scale based on the subject's dwelling.

The morbidity data include the number of days lost from work, school, or other usual activity caused by illness or accident; cause of the disabling illness; whether patient was attended by a physician; whether he was hospitalized; use of services of physicians and surgeons, practitioners other than physicians and surgeons, dentists, nurses, and public health departments; self-rating of health; and incidence of chronic illnesses and disabilities.

The results of the analysis show that incidence and duration of disabling illness and certain kinds of health-care behavior tended to vary with social position.

The Relation of A-Wave Latency of the Electroretinogram to Human Aging.

A. D. WEISS, *Section on Aging, National Institute of Mental Health,* Bethesda.*

The increase of simple reaction time with advancing age has been well documented. As part of a larger program to analyze the time course of simple reaction time into its component parts, the latency of sense organ activation was considered. Although the physiologic basis of the electroretinogram is not well understood, it may be assumed that the initiation of the a-wave represents the initial physiologic response to the physical stimulus of light.

Medically normal old and young male subjects were used. The pupil was first dilated with neosynephrine, and after 10 minutes' dark adaptation the eye was subjected to the first discernible base line change. The data were then analyzed in terms of age, latency, and stimulus intensity.

* National Institutes of Health, United States Public Health Service, Department of Health, Education and Welfare, Bethesda, Maryland.

The Adult's Social Life Space and Successful Aging: Some Suggestions for a Conceptual Framework.

R. H. WILLIAMS, *National Institute of Mental Health, Bethesda, and* MARTIN B. LOEB, *Community Studies, Inc. and Committee on Human Development, University of Chicago.*

The social sciences have done relatively little research and have evolved relatively little by way of a systematic conceptual scheme for describing and evaluating the social life of a particular person, especially among adults. With whom does a given person interact? With how many people does he interact? How often and how long? How intimate is he with whom in his social world? Are the people active in his social environment similar to himself or is there a range and variety of such persons? Is he sometimes superordinate, sometimes a peer and sometimes subordinate or is one position dominant in his social interaction? What kind of a pattern of social life is characteristic of an individual? What is an appropriate or healthy pattern of social life for an individual of given age, sex, social class, and physical health status? A social map can be projected from answers to questions such as these. It is this map which we think of as an individual's "social life space." We plan to explore systematically the social reality within which an individual lives, terms of his interaction with other individuals, and relations between images he has of himself and the images others have of him.

We can assume that there is a pattern or order in these interactions; an individual may have a few or many individuals with whom he interacts. He may interact with greater or lesser intensity; his interactions may be simple or varied. Number, intensity and complexity may then be thought of as 3 major dimensions which make up an individual's social life space. Furthermore, these dimensions may well vary in relation to age, sex, social class, and personality structure.

It is possible to describe the present social life space for any individual. In relating this life space to age, sex, social class, and personality, we may be able to establish some norms for healthy or at least appropriate social life spaces.

SECTION ON SOCIAL WORK AND ADMINISTRATION

Panel: Senile Patients and Their Care.

R. GRINKER, *Psychiatric-Psychosomatic Institute, Michael Reese Hospital, Chicago;* JUDGE O. KERNER, *Chicago;* S. SHINDELL, *Medical Director, Connecticut Commission on the Care and Treatment of the Chronically Ill, Aged and Infirm, Hartford.*

A panel discussion of the patient with a diagnosis of senility is presented from the various points of view of related disciplines.

Questions to be emphasized include the following subjects. Who are the persons now classified as senile? Which of them should be committed to a state mental hospital? What kind of information does the court require from other fields, such as social work, medicine, and psychiatry, in order to make a proper judgment regarding commitment? What is the role of the court? Which patients should remain in state mental hospitals? Which should be removed and what are the best procedures for removal? Can greater cooperation between the professions of law, psychiatry, and social work secure better care for older patients?

Panel: Adult Boarding Homes and Their Place in Community Resources for Older People.

MRS. R. SNYDER, *Department of Welfare, City of New York,* ANNIE MAY PEMBERTON. *Supervisor, Services to the Aged, North Carolina State Department of Public Welfare, Raleigh:* HESTER CRUTCHER, *New York State Department of Mental Hygiene, Albany.*

A panel presentation is based on the ways in which boarding homes have been used successfully in the care of older people. Participants will describe and analyze programs conducted by a city public assistance agency, by a state department of welfare, and by a state department of mental hygiene. Factors to be considered include the recruitment and supervision of boarding homes, the selection and placement of persons to receive boarding home care, and an evaluation of the potentialities of boarding homes for different kinds of older people.

Panel: Planning Education and Recreation Programs for Older Adults.

HENRIETTA RABE, *Supervisor, Education for the Aging, New York State Bureau of Adult Education, Albany;* RUTH HILL, *Director of Community Organization for Aging, Stephenson County, Illinois Public Aid Commission, Freeport;* BOYD, W. H., *Senior Citizens Steering Committee of the Long Beach Community Council, Long Beach, Calif.*

This panel will discuss how different kinds of agencies have taken the responsibility for the planning and stimulation of education and recreation programs. Specific examples will be described, illustrating community organization and program development in various areas. These refer to leadership through a state agency, through a county public welfare department, and through a local welfare council. Allocation of responsibility will be analyzed.

An Analysis of the Relation of Aging to Medical, Social, and Economic Characteristics of Patients as a Basis for an Action Program in Meeting the Health Needs of an Aging Population.

WALTER M. BEATTIE, JR.,* *Director, Community Services to the Aging, Community Welfare Council, Madison.*

In Dane County, Wisconsin, a three-year study has been undertaken to determine the relationship of age to the following; diagnoses of patients, sex difference of patients, disabilities of patients, length of treatment or care for a particular diagnosis, services received and needed, and financial patterns of medical and health care of patients. The survey involved 175 professional persons and included the characteristics of approximately 5,000 patients.

The use of the survey as a method of educating professional persons regarding the aging process in their own areas of responsibility, as well as action, is an important contribution of this study. Community organization as a social work technique in studying and meeting the needs of the aging is an essential part of this methodology. Each profession studied its own areas of service to the aging patient using the questionnaire and interview methods. The Wisconsin State Board of Health tabulated data in order to correlate findings. Independently each profession reviewed the findings from the study and then met jointly in order to develop recommendations for action. Through this process a county wide health plan for the aging was developed:

1) county wide home care services for the aging and long-term patient, including
   a) nursing services
   b) rehabilitation and therapeutic services
   c) social case-work services
   d) part-time housekeeping services
   e) diversional and volunteer services
2) a Substitute Family Plan for the aging
3) an annual inventory of nursing home services
4) the establishment of social service departments in all general hospitals, and,
5) a plan to meet the needs of the mentally infirm aged.

* Present address, Dept. of Sociology, Lindenwood College, St. Charles, Mo.

FELLOWS AND MEMBERS OF THE GERONTOLOGICAL SOCIETY, INC.

(Alphabetical)

August 15, 1956

FB—Fellow, Biological Sciences
FC—Fellow, Clinical Medicine
FP—Fellow, Psychological and Social Sciences
FS—Fellow, Social Work and Administration
M—Member
G—General Section

Abbott, Ouida D. (M) — U. Fla., Gainesville
Abderhalden, R. (FB) — Basel, Switzerland
Abrams, A. J. (FP-FS) — N. Y. State Joint Legis. Comm. on Problems of Aging, Newburgh
Abramson, P. A. (M) — Home for Jewish Aged, Philadelphia, Pa.
Ackermann, P. G. (FB) — Washington U. Med., St. Louis, Mo.
Adams, (Mrs.) G. G. (G) — Methodist Home for Aged Charlotte, N. C.
Adams, J. F. (FP) — Temple U., Philadelphia, Pa.
Adams, M. E. (M) — Starke, Fla.
Adelman, W. (FS) — Beth Abraham Home, Bronx, N. Y.
Adler, M. (G) — Detroit, Mich.
Adlersberg, D. (FC) — New York City
Agress, W. L. (G) — Sinai Hosp., Detroit, Mich.
Ainlay, G. W., Sr. (FC) — Los Angeles, Calif.
Albanese, A. A. (FB) — St. Luke's Conval. Hosp., Greenwich, Conn.
Albrecht, Ruth (FP) — Ala. Polytechnic Inst., Auburn
Aldridge, G. J. (FP) — Mich. State Coll., East Lansing
Alessandrini, P. (FC) — Hosp. of Rome, Rome, Italy
Alessandrini, S. (G) — Rome, Italy
Alexander, M. (FS) — Providence, R. I.
Alexander, (Mrs.) W. M. (G) — Nashville, Tenn.
Allen, W. M. (FC) — Washington U. Med., St. Louis, Mo.
Aller, C. (FP) — U. Calif., Berkeley
Alsberg, Julia (G) — Vocational Counsel. Serv., St. Louis, Mo.
Amako, F. (FC) — Tokyo, Japan
Amato, L. L. (FC) — Fort Lauderdale, Fla.
Amulree, Lord B. W. S. (FC-FS) — St. Pancras Hosp., London, England
Anderson, C. L. (FP) — Denver, Colo.
Anderson, G. J. (G) — Graham, N. C.
Anderson, H. H. (FP) — East Lansing, Mich.
Anderson, J. E. (M) — U. Minn., Minneapolis
Anderson, K. W. (G) — Minneapolis, Minn.
Anderson, W. C. (M) — Ind. State Bd. Health, Indianapolis
Anderton, J. F. (M) — Lansing, Mich.
Andosca, J. B. (FC) — Long Island Hosp., Boston, Mass.
André, Beverly C. (FP) — Orange, Calif.
Andrew, W. (FB) — Bowman Gray Med., Winston-Salem, N. C.
Andrus, Ruth (FP) — Walt Fd., Cold Springs-on-Hudson, N. Y.
Angrist, A. A. (FC) — Albert Einstein Coll. Med., Bronx, N. Y.
Apfeldorf, M. (M) — Martinsburg, W. Va.
Aronson, J. M. (FC) — Oak Forest Infirm., Oak Forest, Ill.
Aronson, (Mrs.) R. J. (M) — Seattle, Wash.
Arthur, Ila I. (M) — Grand Rapids, Mich.
Aschaffenburg, Helga (G) — Jamaica, L. I., N. Y.
Atchley, M. H. (G) — U. Fla., Gainesville
Athan, P. W. (M) — San Diego, Calif.
Atkinson, Mildred (M) — Counc. of Churches, Baltimore, Md.
Aub, J. C. (FB) — Mass. Gen. Hosp., Boston
Authier, V. Charlotte (G) — Dept. Welf., New York City
Avrack, J. A. (FC) — New York City

Bachrach, S. (FC) — Worcester, Mass.
Badgley, C. E. (FC) — U. Hosp., Ann Arbor, Mich.
Baird, B. (M) — U. Calif., Berkeley
Baker, H. E. (FS) — Chula Vista, Calif.
Baker, Ruth (FS) — Cleveland, Ohio
Baker, S. P. (FC) — Baltimore City Hosps., Baltimore, Md.
Ball, May T. (G) — Dallas, Texas
Banfield, W. G. (M) — Nat. Cancer Inst., Bethesda, Md.
Banham, Katharine M. (FP) — Duke U., Durham, N. C.
Barkin, S. (FP) — Textile Workers Union of Am., N. Y. C.
Barnes, (Mrs.) L. (M) — Lansing, Mich.
Barnes, L. L. (FB) — Cornell U., Ithaca, N. Y.
Barnes, R. H. (FC) — Duke U., Durham, N. C.
Barron, Ann M. (M) — Hollywood, Calif.
Barrows, C. H., Jr. (M) — Baltimore, Md.
Bartlett, L. W. (FS) — Chicago, Ill.
Bartlett, Lucille C. (M) — Old Peoples Home, Chicago, Ill.
Basilevich, I. (FC) — State Hosp. Ment. Dis., Howard, R. I.
Basquin, Martha A. (G) — East Lansing, Mich.
Bass, I. (G) — Sephardic Home for Aged, Brooklyn, N. Y.
Bates, L. E. (G) — Ingham County Bur. Soc. Aid, Lansing, Mich.
Bauer, W. (FC) — Mass. Gen. Hosp., Boston, Mass.
Baxt, R. (FS) — Fed. Employ. Serv., New York City
Bay, E. B. (FC) — Chicago, Ill.
Bayley, Nancy (FP) — Nat. Inst. Mental Health, Bethesda, Md.
Bayne, J. R. D. (M) — Sherbrooke, Que., Canada
Beagin, J. A. (G) — Los Angeles, Calif.
Beard, Belle B. (FP) — Sweet Briar Coll., Sweet Briar, Va.
Beattie, W. M., Jr. (M) — Lindenwood Coll., St. Charles, Mo.
Beatty, D. C. (G) — Williamston, Mich.
Beaty, Mary B. (M) — J. Walter Thompson Co., New York City
Beauchamp, G. E. (FP) — Orange Gardens, Inc., Kissimmee, Fla.
Beber, M. (FC) — Omaha, Nebr.
Beckman, R. O. (M) — Hialeah, Fla.
Beem, J. R. (M) — Lansdale, Pa.
Behrend, H. J. (FC) — New York City
Belcher, D. L. (FP) — Reserve Life Ins. Co., Dallas, Texas
Beller, M. L. (M) — Philadelphia, Pa.
Belt, E. (FC) — Elmer Belt Urol. Gp., Los Angeles, Calif.
Beltrán Báguena, M. (FC) — Valencia, Spain
Benjamin, R. (M) — Cold Spring Inst., Cold Spring-on-Hudson, N. Y.
Bennett, G. K. (FP) — Psychological Corp., New York City
Bennett, H. B. (FC) — Detroit, Mich.
Berg, B. N. (FB) — Coll. Phys. & Surg., New York City
Berg, M. (M) — Park View Home, Chicago, Ill.
Bergler, E. (FP) — New York City
Bergman, R. A. M. (FB-FC) — Royal Trop. Inst., Amsterdam, Holland
Bergman, W. G. (FP) — Detroit Pub. Schs., Detroit, Mich.
Berman, J. P. (FC) — Brooklyn, N. Y.
Berry, Gladys J. (G) — Orrtanna, Pa.
Bickerman, H. A. (FC) — New York City
Bierring, W. L. (M) — Ia. State Health Dept., Des Moines, Iowa
Biester, Alice (FB) — Santa Barbara, Calif.
Bigart, W. D. (M) — Syracuse, N. Y.
Biller, N. M. (FS) — New York City
Birren, J. E. (FP-FB) — Nat. Inst. Ment. Health, Bethesda, Md.
Biskind, G. R. (FB) — San Francisco, Calif.
Biskind, M. S. (FC) — Westport, Conn.
Bjork, V. D. (M) — Flower Hosp., Toledo, Ohio
Bjorksten, J. (FB) — Madison, Wisc.
Bjorn, Ruth D. (G) — Friendship House, Columbus, Ohio
Blache, J. O. (FB-FC) — St. Louis, Mo.
Black, M. G. (FC) — Holyoke Hosp., Holyoke, Mass.
Black, S. J. (G) — Home for Aged Sons & Daugh. Israel, Bellaire, Texas
Blackburn, H. S. (FS) — Springfield, Ohio
Blades, B. (FC) — Washington, D. C.
Blair, E. (FC) — U. Colo. Med. Cen., Denver
Blair, R. H. (M) — Ward Homestead, Maplewood, N. J.
Blee, Margaret (G) — Chapel Hill, N. C.
Block, R. E. (G) — Golden Acres, Dallas, Tex.
Bloomstein, L. B. (FS) — United Home for Aged Hebrews, New Rochelle, N. Y.
Bluestone, E. M. (FS) — New York City
Blumberg, N. (FC) — Philadelphia, Pa.
Blumenthal, H. T. (FB) — Jewish Hosp., St. Louis, Mo.
Bogante, J. R. (M) — Montréal, Canada
Boggs, Anna M. (M) — W. Va. U., Morgantown
Bogue, LaVerna M. (M) — Bogue Nursing Home, East Lansing, Mich.
Bohatirchuk, F. (FB) — Ottawa, Ont., Canada
Bonachea Vargas, M. (FC) — Santa Clara, Las Villas, Cuba
Bond, Betty W. (M) — Minn. Dept. Health, Minneapolis
Bond, J. H. (M) — Dept. Health, Educ. & Welf., Dallas, Texas
Booker, M. D. (M) — New Hope Baptist Church, Dallas, Texas
Booth, C. B. (FS) — Volunteers of Am., New York City
Borg, J. F. (FC) — St. Paul, Minn.
Bortz, E. L. (FB) — Philadelphia, Pa.
Bosse, R. C. (G) — Lutheran Home for Aged, Westlake, Ohio
Bosworth, C. A. (G) — East Lansing, Mich.
Botwinick J. (G) — Nat. Inst. Ment. Health, Bethesda, Md.
Boucek, R. J. (M) — Miami, Fla.
Bourne, G. H. (FB) — London Hosp. Med. Coll., London, England
Bowdish, P. (FC) — Mo. State Sch., Marshall
Bowen, Georgene E. (FS) — Philadelphia, Pa.
Bower, Lillian M. (M) — Detroit, Mich.
Boyd, W. H. (FC) — Long Beach, Calif.
Brackebusch, Frieda M. (FS) — Soc. Plann. Counc., St. Louis, Mo.
Brady, Virginia A. (M) — Buffalo, N. Y.
Bramble, Anna D. (G) — Philadelphia, Pa.
Brandstetter, Ellen (M) — Chicago, Ill.
Brandvold, D. C. (M) — Sunnyside Rest Home, Lake Park, Minn.
Brant, B. (FS) — Kansas City, Mo.
Braschi, R. T. (M) — Off. Personnel, San Juan, Puerto Rico

Brauer, R. W. (FB) — U. S. Naval Radiol. Def. Lab., San Francisco, Calif.
Breckinridge, Elizabeth L. (FP) — Ill. Pub. Aid Commission, Chicago
Breen, L. Z. (M) — Chicago, Ill.
Breslow, L. (FC) — Calif. State Dept. Pub. Health, Berkeley
Brewster, G. F. (FS) — Ocean Grove, N. J.
Britton, J. H. (FP) — Pa. State U., U. Park
Broderick, Louise (M) — Broadway Rest Home, San Diego, Calif.
Brodie, Dorothy B. (M) — Child Guidance Clinic, St. Petersburg, Fla.
Brody, H. (M) — U. Buffalo Med., Buffalo, N. Y.
Bronstein, L. H. (FC) — New York City
Brook, B. N. (M) — Jewish Comm. Counc., Tucson, Ariz.
Brooks, C. F. (M) — E. D. Farmer Fd., Dallas, Texas
Brooks, Katherine G. (G) — Cleveland Heights, Ohio
Broudo, P. H. (FC) — Detroit, Mich.
Brown, A. M. (FB) — Chicago, Ill.
Browne-Mayers, Charlotte (FP) — New York City
Brownson, R. H. (FB) — Med. Coll. Va., Richmond
Brozen, B. A. (FC) — Brooklyn, N. Y.
Brubaker, O. (FS) — United Steel Workers of Am., Pittsburgh, Pa.
Bruce, C. N. (M) — New Castle, Pa.
Bruce, H. D. (M) — East Lansing, Mich.
Bruch, E. (FC) — Winnebago, Ill.
Bruger, M. (FC) — New York City
Brull, L. (FC) — U. Liège, Liège, Belgium
Bruner, J. L. (G) — Richmond, Va.
Bruner, Louise (M) — Toledo, Ohio
Brungard, (Mrs.) E. G. (G) — St. Louis, Mo.
Brush, Miriam K. (FB) — New Brunswick, N. J.
Bucher, Nancy L. R. (FB) — Cambridge, Mass.
Buckley, J. C. (M) — Bridgeport, Conn.
Bullen, Adelaide K. (FP) — Fla. State Museum, Gainesville
Bunch, M. E. (FP) — Washington U., St. Louis, Mo.
Bunnag, M. (FC) — Grand Palace, Bangkok, Thailand
Burgess, E. W. (FP) — U. Chicago, Chicago, Ill.
Burke, Vera M. (FS) — Home for Aged & Infirm Hebrews, New York City
Burkhard, R. V. (G) — St. Petersburg, Fla.
Burkholder, O. S. (M) — Institutional Admin., Houston, Texas
Burks, Eleanor H. (FS) — Family & Children's Serv., Minneapolis
Burman, L. R. (FC-FB) — Bronx, N. Y.
Burstein, Sona R. (FP) — Wellcome Hist. Med. Museum, London, England
Burt, Ada L. (M) — U. Utah, Salt Lake City
Busse, E. W. (FC) — Duke U. Med., Durham, S. C.

Cadenas, A. (FC) — Sanitary Zone Sechura, Piura, Peru
Caldwell, Virginia S. (M) — King's Daughters Home, Louisville, Ky.
Callahan, Barbara (M) — Catholic Hosp. Assn., St. Louis, Mo.
Calver, G. W. (FC) — U. S. Capitol, Washington, D. C.
Cameron, J. A. (FB) — Dallas, Texas
Campbell, Mary M. (M) — Vancouver, B. C., Canada
Cantor, L. R. (M) — Beth Sholom Home of Va., Richmond
Carey, Jean W. (FS) — New York City
Carlgren, Constance G. (G) — Dept. Pub. Welf., St. Paul, Minn.
Carlson, A. J. (FB) — U. Chicago, Chicago, Ill.
Carp, L. (FC) — Coldwater Mem. Hosp., New York City
Carter, B. (M) — Duke Hosp., Durham, N. C.
Carter, G. W. (M) — Berkeley, Calif.
Carter, H. W. (FC) — St. Petersburg, Fla.
Carter, S. (M) — Los Angeles, Calif.
Casarett, G. W. (FB) — Rochester, N. Y.
Caserta, C. I. (M) — Stratford Chronic & Conval. Hosp., Stratford, Conn.
Castle, D. L. (M) — Hudson-Webber Fd., Detroit, Mich.
Cerny, R. G. (FP) — Minneapolis, Minn.
Chaikoff, I. L. (FB) — U. Calif. Med., Berkeley
Chandler, A. R. (FP) — Ohio State U., Columbus
Chaney, Laura J. (FS) — Warrensburg, Mo.
Chapman, A. L. (G) — New York City
Charipper, H. A. (M) — N. Y. U., New York City
Charles, W. (G) — St. Louis, Mo.
Chesrow, E. J. (FC-FS) — Oak Forest Infirm., Oak Forest, Ill.
Chewning, J. B. (M) — Wm. S. Merrell Co., Cincinnati, Ohio
Chieffi, Margaret (FB-FC) — St. Louis, Mo.
Chinn, A. B. (FC) — Cleveland, Ohio
Chow, B. F. (FB) — Johns Hopkins U., Baltimore, Md.
Church, L. E. (FC-FB) — Bethesda, Md.
Claghorn, A. (M) — Darien, Conn.
Clark, K. R. (FP) — Chicago, Ill.
Clay, Frances (FS) — UIU Retirement Vill. & Conv. Home Philadelphia, Pa.
Clements, L. (G) — Christian Counc. of Atlanta, Atlanta, Ga.
Cobb, W. M. (FC) — Howard U. Med., Washington, D. C.
Coble, J. F. (M) — Methodist Retirement Home, Durham, N. C.
Cochran, Rubye (M) — Amarillo Senior Citizens Proj., Amarillo, Texas
Cohen, A. H. (FS) — New York City
Cohen, C. R. (FS) — Home for Jewish Aged, Cincinnati, Ohio
Cohen, H. H. (M) — Reform Cong. Keneseth Israel, Philadelphia
Cohen, W. J. (G) — U. Mich., Ann Arbor
Cohn, B. H. (M) — Washington Springs Nursing Home, Okawville, Ill.
Coleman, B. S. (M) — Chase San., Los Angeles, Calif.
Collens, W. S. (FC) — Brooklyn, N. Y.
Collips, J. B. (FB) — U. W. Ontario, London, Canada
Comanor, A. (M) — Miami, Fla.
Comens, P. (M) — St. Louis, Mo.
Commons, R. R. (FC) — Los Angeles, Calif.
Connell, J. A. (G) — Washington, D. C.
Constantinides, P. (M) — U. Brit. Col. Med, Vancouver, Canada
Convery, J. W. (FS) — Nat. Assn. Mfg., New York City
Conwell, D. V. (FC) — Wichita, Kans.
Cook, J. W. (M) — Nashville, Tenn.
Cooke, Asenath (M) — N. C. State Bd. Health, Burlington
Coons, Dorothy H. (M) — U. Mich., Ann Arbor
Coppinger, N. W. (M) — Vet. Admin. Cen., Wadsworth, Kans.
Cordonnier, J. J. (FC) — Wohl Memorial Hosp., St. Louis, Mo.
Cornish, Sarah H. (FS) — Peter Bent Brigham Hosp., Boston, Mass.
Costello, J. P. (FC) — St. Louis, Mo.
Cottet, J. (FC) — Paris, France
Cotton, A. L. (M) — Upjohn Co., Kalamazoo, Mich.
Cottrell, T. L. (FC) — Chicago, Ill.
Co Tui, F. (FB-FC) — Creedmoor Inst. for Psychobiol. Studies, Queens Village, N. Y.
Coullaud, D. (M) — Angers, France
Coutts, Mary F. (M) — Brookline, Mass.
Covalt, Nila K. (FC) — Winter Park, Fla.
Covell, W. P. (FB) — Washington U. Med., St. Louis, Mo.
Cowdry, E. V. (FB) — Washington U. Med., St. Louis, Mo.
Cox, B. C. (G) — Melling Forging Co., Lansing, Mich.
Crampton, C. W. (FC) — New York City
Crisler, G. R. (FC) — Winter Park, Fla.
Crohn, B. B. (FC) — New York City
Cromwell, J. H. (G) — C. & P. Telephone Co., Baltimore
Cromwell, L. W. (FC) — San Diego, Calif.
Crosby, E. L. (FC) — Am. Hosp. Assn., Chicago, Ill.
Crow, W. A. (M) — Detroit, Mich.
Cruickshank, W. H. (FC) — Bell Telephone Co., Montréal, Canada
Cummins, Evelyn F. (G) — Oklahoma City, Okla.
Currin, Maurine A. (G) — Texas Dept. Pub. Welf., Austin

Dabney, Susan (G) — Lynchburg, Va.
Dacso, M. M. (FC) — Goldwater Mem. Hosp., New York, City
Dahlen, M. A. (M) — Evangelical Lutheran Church, Minneapolis
Dailey, J. B. (G) — Pine Forest Rest, Jackson, N. C.
Daniel, L. A. (M) — Fla. State Employ. Serv., Miami
Daniels, Corinne (G) — Hewlett, L. I., N. Y.
Davies, D. F. (FB) — New York City
Davis, G. E. (FP) — Purdue U., Lafayette, Ind.
Davis, Gladys W. (M) — Davis Nursing Home, Springfield, Mo.
Davis, Ralph E. (FP) — Woodville State Hosp., Woodville, Pa.
Davis, Roger T. (M) — Austin, Texas
Davis, W. H. (FC) — Van Nuys, Calif.
Day, E. (FC) — Scarsdale, N. Y.
Deardorff, Neva R. (FS) — New York City
Dedichen, J. (FC) — Rikshosp., Oslo, Norway
del Castillo, E. B. (FC) — Buenos Aires, Argentina
DeBaun, Sylvia (M) — Atlanta, Ga.
De Long, E. W. (M) — Beverly Hills, Calif.
DeMott, J. D. (FP) — Kansas City, Mo.
Dempster, H. G. (FP) — Detroit Edison Co., Detroit, Mich.
Dennis, W. (FP) — Brooklyn Coll., Brooklyn, N. Y.
Dent, (Mrs.) E. (M) — Greenville, Del.
Derow, H. A. (FC) — Boston, Mass.
DeSilva, J. T. (FS) — Los Angeles, Calif.
Desmond, T. C. (FS) — Newburg, N. Y.
de Vido, G. (FC) — Treviso, Italy
Diamond M. (G) — Sherman Oaks, Calif.
Dierks, A. G. (FS) — Le Bonheur Children's Hosp., Memphis
Dill, E. M. (M) — Ind. Masonic Home, Franklin, Ind.
Dobler, Isabel H. (M) — St. Louis, Mo.
Dobrin, L. (FC) — Forest Hills, L. I., N. Y.
Dockstader, Ione A. (M) — Ariz. Assn. Nursing Homes, Phoenix
Dolbec, V. R. (M) — Assumption Coll., Worchester, Mass.
Donahue, Wilma T. (FP) — U. Mich., Ann Arbor
Dorcus, R. M. (FP) — Los Angeles, Calif.
Dowd, G. C. (FC) — Worcester, Mass.
Dowling, A. S. (M) — Montebello State Hosp., Baltimore, Md.
Dreier, W. H. (M) — Hubbard, Iowa
Dubovsky, B. (FC) — Home of Sons & Daugh. Israel, N. Y. C.
Dubreuil, L. (FC) — Health Dept., Montréal, Canada
Dunbar, A. (G) — Alden, Mich.
Dunbar, Flanders (FC) — New York City
Dunbar, Francis (FP) — New York City
Dury, A. (FB) — Bradford Hosp., Bradford, Pa.
Dustin, R. E. (FC) — Tecumseh, Mich.
Dustin, Virginia L. (M) — Geriatrics, Minneapolis, Minn.

Earle, W. R. (FB) — Nat. Cancer Inst., Bethesda, Md.
Ebbinghaus, W. R. (M) — Am. Nat. Red Cross, St. Louis, Mo.
Eberly, J. W. (FP) — Texas State Coll. for Women, Denton
Ebert, Virginia B. (M) — Salem, Mass.
Eckhardt, Gertrude (G) — Bergen Country Tuberculosis & Health Assn., Hackensack, N. J.
Eden, M. (FB) — Nat. Heart Inst., Bethesda, Md.
Edler, K. F., Jr. (FS) — Omaha, Nebr.
Edson, C. A. (M) — Soc. Sec. Admin., Syracuse, N. Y.
Edwards, G. A. (M) — St. Dept. Health, Albany, N. Y.
Edwards, J. C. (FC) — St. Louis, Mo.
Edwards, Mabel I. (M) — Iowa City, Iowa

Egloff, W. C. (FC) — Mason City, Iowa
Eichenlaub, Katherine (FP) — Englewood, N. J.
Elcock, (Mrs.) C. E. (M) — Aged Women's and Aged Men's Homes, Baltimore
Elgin, Genevieve V. (M) — Fresno, Calif.
Ellicott, V. L. (FC) — Baltimore, Md.
Ellington, Berta (G) — Houston, Texas
Elson, J. (FC) — St. Louis, Mo.
Engelberg, H. (FC) — Beverly Hills, Calif.
Engle, E. T. (FB) — Coll. Phys. & Surg., New York City
Entman, S. (FS) — River Garden Home for Aged, Jacksonville
Epstein, F. H. (FC) — U. Mich., Ann Arbor
Erikson, C. A. (FS) — Schmidt, Garden and Erikson, Chicago
Esman, J. (M) — B'nai B'rith Home & Hosp. for Aged, Memphis, Tenn.
Evans, E. (FC) — Orlando, Fla.
Evans, Elizabeth (FS) — Episcopal Serv. to Aged, N. Y. C.
Evans, S. M. (FC) — Milwaukee, Wisc.
Evans, W. (G) — Juliette Fowler Homes, Dallas, Texas
Everts, W. H. (FC) — West Palm Beach, Fla.
Ewald, R. V. (M) — Downtown Fd., Minneapolis, Minn.
Ewing, J. H. (G) — New York City
Eyre, Ruth A. (FS) — Chicago, Ill.

Face, L. R. (G) — Lansing, Mich.
Faddis, Margene O. (FP) — Cleveland, Ohio
Faiek, A. (G) — Coll. Phys. & Surg., New York City
Falls, F. H. (G) — River Forest, Ill.
Falzone, J. A., Jr. (FC) — Baltimore City Hosp., Baltimore, Md.
Fanson, Ethel (FC) — Pasadena, Calif.
Farber A. S. (M) — Galland Home for Aged, Seattle, Wash.
Farber, S. (FB) — Children's Hosp., Boston, Mass.
Farfel, B. (FC) — Houston, Texas
Farris, E. J. (FB) — Wistar Inst. Anat. & Biol., Philadelphia
Farrow, W. S. (G) — Methodist Home for Aged, Charlotte, N. C.
Fauri, F. F. (FS) — U. Mich., Ann Arbor
Fazekas, J. F. (FC) — Gallinger Muncip. Hosp., Washington, D. C.
Feifel, H. (FP) — Vet. Admin. Ment. Hyg. Clinic, Los Angeles
Feild, (Mrs.) R. D. (FS) — New Orleans, La.
Feingold, S. N. (FS) — Jewish Vocational Serv., Boston, Mass.
Feldstein, M. (FC) — New York City
Ferderber, M. B. (FP-FC) — Pittsburgh, Pa.
Ferguson, E. B. (FS) — Diocese of Calif., San Francisco
Fink, H. H. (FP) — Ingham County Hosp., Okemos, Mich.
Firket, J. (FB) — Inst., Pathol., Liège, Belgium
Fischoff, E. (M) — Yale U., New Haven, Conn.
Fitts, W. T., Jr. (FC) — U. Pa., Philadelphia
Flack, Katherine (FB) — Syracuse, N. Y.
Fleck, S. (FC) — Yale U. Med., New Haven, Conn.
Fleck, W. L. (FP) — Vet. Hosp., Fort Howard, Md.
Fleetwood, J. (FC) — Dublin, Ireland
Fleming, C. (FP) — U. Sheffield, Sheffield, England
Flipse, M. E. (FC) — Bethesda, Md.
Flocks, R. H. (FC) — U. Hosp., Iowa City, Iowa
Flores, N. A. (FC) — San Miguel de Tucumán, Argentina
Foa, C. (FB) — Milan, Italy
Foldes, F. F. (FB) — Mercy Hosp., Pittsburgh, Pa.
Folkoff, J. P. (FS) — Levindale Hebrew Home, Baltimore, Md.
Foote, E. T. (G) — St. Louis, Mo.
Ford, J. H. (M) — Los Angeles, Calif.
Forero Nougues, L. G. (FC) — Bogotá, Colombia
Forman, J. (FC) — Columbus, Ohio
Forsstrand, Esther C. (FS) — Philadelphia, Pa.
Fortune, G. (FS) — Cleveland Hearing & Speech Cen., Cleveland
Fox, Flora (FS) — New York City
Fox, Irene (M) — Doctors Mem. San., Dallas, Texas
Fox, V. (G) — Fla. State U., Tallahassee
Fraenkel, Marta (M) — Dept. Hosp., New York City
Frank, L. K. (FP-Senior Mrb.) — Belmont, Mass.
Frankenthal, L. E., Jr. (M) — Chicago, Ill.
Frazier, (Mrs.) Loudell (FS) — State Dept. Soc. Welf., Topeka, Kansas
Freeman, J. T. (FC) — Philadelphia, Pa.
Fremont-Smith F. (Hon.) — New York City
Frewin, O. W. (FC) — Adelaide, South Australia
Frieb, J. (FC) — Prague, Czechoslovakia
Friedfeld, L. (FC) — New York City
Friedman, G. M. (FS) — Chicago, Ill.
Friedman, O. L. (FC) — Holbrook Manor Nursing Home, Holbrook, L. I., N. Y.
Friedman, S. (M) — Detroit, Mich.
Froelicher, F. M. (M) — Dept. Educ., Baltimore, Md.
From Hansen, P. (FB-FC) — Copenhagen, Denmark
Fryman, Evelyn R. (G) — Home for Jewish Aged, Philadelphia, Pa.
Fryon, (Mrs.) E. (M) — Geriatric Counc., Muskegon, Mich.

Gabrielsen, Lucy (FS) — Salvation Army, St. Louis, Mo.
Gabrielson, J. (M) — Los Angeles, Calif.
Gärdstam, R. (FC) — Stockholm, Sweden
Gancsov, P. (FC) — St. Louis, Mo.
Gardner, T. S. (FB) — Rutherford, N. J.
Garon, B. L. (M) — Calif. Home for Aged at Reseda, L. A.
Garrett, Ruby D. (M) — Kansas City, Mo.
Gaukel, T. L. (G) — Soc. Sec. Admin., St. Louis, Mo.
Gebhart, Dorothy (M) — Topeka, Kans.
Geetter, I. S. (FC) — Mt. Sinai Hosp., Hartford, Conn.
Gelil, T. (FC) — De Gamles By, Copenhagen, Denmark
Geld, S. (FS) — Clifton, N. J.
Genkins, M. H. (FB) — Norristown, Pa.
George, A. K. (M) — U. Cincinnati Med., Cincinnati, Ohio
Gershon-Cohen, J. (FC) — Philadelphia, Pa.
Gertman, S. (FC) — Miami, Fla.
Geschelin, Sadye D. (M) — Berkley, Mich.
Getty, R. (FB) — Iowa State Coll., Ames
Getzoff, L. J. (M) — Bronx, N. Y.
Gey, G. O. (M) — Johns Hopkins Hosp., Baltimore, Md.
Gilbert, Jeanne G. (FP) — Brooklyn, N. Y.
Gildea, E. F. (FC) — Washington U. Med., St. Louis, Mo.
Gingrich, W. D. (M) — U. Texas Med., Galveston
Ginzberg, Vilma O. (FP) — Tomah, Wisc.
Gitman, L. (FC) — Brooklyn Hebrew Home & Hosp. for Aged, Brooklyn, N. Y.
Gittins, P. (FC) — Detroit, Mich.
Glass, W. H. (FC) — Hartford, Conn.
Gleim, Chloe E. (FS) — Chicago, Ill.
Glenn, P. F. (M) — Sharon, Pa.
Glinos, A. D. (FB) — Walter Reed Army Inst. Res., Washington, D. C.
Glonning, F. J. (G) — Vet. Admin. Cen., Camp White, Oregon
Glück, Charlotte V. N. (FS) — New York City
Goff, Phoebe H. (FS) — Brooklyn, N. Y.
Gold, J. G. (FS) — Chicago, Ill.
Goldblatt, H. (FB) — Mt. Sinai Hosp., Cleveland, Ohio
Goldfarb, A. I. (FC) — New York City
Goldshine, A. D. (FC) — Boston, Mass.
Goldstein, B. (FS) — Jewish Family Serv., Dallas, Texas
Goldstein, N. (FB) — Los Angeles, Calif.
Gonterman, J. W., Jr. (FS) — Clayton, Mo.
Good, Jean (FS) — Welf. Counc., Toronto, Canada
Goodhart, R. S. (M) — Nat. Vitamin Fd., New York City
Gottlieb, H. (FB) — Bjorksten Res. Labs., Madison, Wisc.
Gowen, C. R. (FC) — Gowen San., Shreveport, La.
Grad, B. (FB) — McGill U., Montréal, Canada
Graff, Mrs. A. (M) — Baltimore, Md.
Graff, R. J. (FC) — Manteno State Hosp., Manteno, Ill.
Graham, J. E. (FS) — George Weston Ltd., Toronto, Canada
Graham, Jewel B. (G) — Iowa State Coll., Ames
Granick, S. (FP) — St. Christopher's Hosp., Philadelphia, Pa.
Greeley, H. P. (FC) — Madison, Wisc.
Greenblatt, I. J. (FB) — Brooklyn, N. Y.
Greene, W. S., III (M) — Washington, D. C.
Greppi, E. (FC) — Florence, Italy
Griffin, J. J. (FS) — Bur. Old Age Assis., Somerville, Mass.
Grinschpun, S. (FC) — Santiago, Chile
Groller, R. J. (M) — Riverview Home, Philadelphia, Pa.
Gross, F. (FB-FC) — Ciba Ltd., Basel, Switzerland
Grossman, B. L. (FS) — Chicago, Ill.
Grossman, C. S. (M) — New York City
Grossman, Carolyn K. (FP) — Cleveland, Ohio
Grotjahn, M. (M) — Beverly Hills, Calif.
Groulx, A. (FS) — Health Dept., Montréal, Canada
Grout, Julia R. (G) — Durham, N. C.
Gruman, G. (M) — Cambridge, Mass.
Gutiérrez, H. (M) — Torreón, Coah., México

Haight, Mary (FS) — Community Counc., Portland, Oregon
Hailman, H. F. (FC) — Upjohn Co., Kalamazoo, Mich.
Hains, Frances B. (M) — Newark, N. J.
Halberstater, Rebecca (M) — Jersey City, N. J.
Halbert, V. A. (FS) — Home for Incurables, Baltimore, Md.
Hall, H. R. (FS) — Wellesley Hills, Mass.
Hall, P. B. (M) — Family & Children's Serv., Pittsburgh, Pa.
Halsey, Marion S. (FS) — Washington, D. C.
Hamilton, James A. (FP) — San Francisco, Calif.
Hamilton, James B. (FB) — L. I. Coll. Med., Brooklyn, N. Y.
Hamilton, Julia M. (FS) — Lake Forest, Ill.
Hamilton, Marjorie A. (G) — San Francisco, Calif.
Hamwi, G. J. (FC) — Ohio State U., Columbus
Hanson, A. T. (G) — West Point Mfg. Co., West Point, Ga.
Hanssen, P. (FC) — Rogaland sjukehus, Stravanger, Norway
Hardwicke, H. M. (M) — Div. Health, Jefferson City, Mo.
Hargrove, Mary M. (G) — Convalescent Cen., Fort Worth, Texas
Harlan, W. H. (M) — Ohio U., Athens
Harper, E. B. (G) — East Lansing, Mich.
Harper, Georgina (M) — Hamilton, Ont., Canada
Harper, H. R. (FS) — Denver, Colo.
Harris, Raymond (FC) — Albany, N. Y.
Harris, Reed (M) — Nat. Soc. of Seniors, Washington, D. C.
Harris, Robert S. (FB) — Mass. Inst. Technol., Cambridge
Hartman, W. (G) — Cincinnati, Ohio
Hartroft, W. S. (FB) — Washington U. Med., St. Louis, Mo.
Hartung, C. A. (FC) — Chattanooga, Tenn.
Harvey, G. B. (G) — Methodist Church, Los Angeles, Calif.
Harvey, Ruth M. (M) — Counc. Church Women, Minneapolis, Minn.
Hashinger, E. H. (FC) — Kansas City, Mo.
Hastings, A. B. (FB) — Harvard U. Med., Boston, Mass.
Hastings, (Mrs.) W. A. (G) — Madison, Wisc.
Havighurst, R. J. (FP) — U. Chicago, Chicago, Ill.
Hawk, E. A. (FC) — Upjohn Co., Kalamazoo, Mich.
Hayes, J. M. (M) — N. C. Baptist Home, Winston-Salem, N. C.
Hayford, W. D. (M) — Lansing, Mich.
Haynes, B. H. (M) — Sylacauga, Ala.
Haynes, R. (M) — Omaha, Nebr.
Hays, D. M. (FC) — Los Angeles, Calif.

Hays, Mahela W. (FP) Valparaiso U., Valparaiso, Ind.
Hebb, D. O. (FP) McGill U., Montréal, Canada
Heglin, H. J. (M) Panama City, Fla.
Hegreness, M. S. (G) Scott County Ment. Health Cen., Davenport, Iowa
Heims, E. H. (M) San Francisco, Calif.
Heinle, R. W. (FC) Upjohn Co., Kalamazoo, Mich.
Hellbaum, A. A. (FC) U. Okla. Med., Oklahoma City
Heller, R. A. (FC) Long Beach, Calif.
Henderson, E. (FC) Montclair, N. J.
Hepburn, Sarah K. (M) Grosse Pointe Park, Mich.
Hepner, Muriel M. (M) Crestwood Conval. Home, Mt. Vernon, N. Y.
Herbeuval, R. (FC) Maison Dept. de Secours, Nancy, France
Hertz, R. S. (G) Detroit, Mich.
Hertznecher, M. Frances (G) Grand Lodge, Mich.
Herz, K. G. (FS) Berkeley, Calif.
Herzberg, F. (FC) Van Nuys, Calif.
Hewitt, A. L. (FC) Lubbock, Texas
Hewitt, E. S. (FP) E. S. Hewitt & Assoc., Libertyville, Ill.
Hexter, M. B. (FS) New York City
Hickey, Margaret (M) Ladies Home Journal, Philadelphia, Pa.
Hicks, F. D. (M) Chicago, Ill.
Hill, Lillian B. (FP) Dixon, Calif.
Himwich, H. E. (FB) Galesburg, Ill.
Hines, H. M. (FB) State U. Iowa, Iowa City
Hinman, F. (FB) Atherton, Calif.
Hinton, G. S. (G) Duke Hosp., Durham, N. C.
Hirsch, S. (FB) Brussels, Belgium
Hisaw, F. L. (FB) Harvard U., Cambridge, Mass.
Hobbs, G. E. (FC) U. W. Ontario, London, Canada
Hobbs, G. Warfield, III (FS) Westport, Conn.
Hochman, J. (FP) New York City
Hoelzel, F. (FB) U. Chicago, Chicago, Ill.
Hoffman, R. S. (FC) Bronx, N. Y.
Hoffmeyer, J. F. M. (FS) S. C. Methodist Home, Orangeburg, S. C.
Hofstatter, Lilli (FB) St. Louis, Mo.
Holloway, E. E. (M) Philadelphia, Pa.
Holmes, F. (FP) Lafayette, Ind.
Holmested (Miss) H. H. (M) Toronto, Canada
Holmquist, C. A. (M) Lutheran Serv. Soc. of W. Pa., Pittsburgh
Holstein, Ida M. (M) Detroit, Mich.
Homburger, F. (FC) Boston, Mass.
Hopkins, E. H. (FP) Washington U., St. Louis, Mo.
Horonick, A. (M) Inst. of Geriatrics, Bronx, N. Y.
Horvath, S. M. (FB-FC) State U. Iowa Med., Iowa City
Horwitt, M. K. (FB) Elgin State Hosp., Elgin, Ill.
Horwitz, C. S. (FS) Philadelphia, Pa.
Hoskins, R. G. (FB-FC) Waban, Mass.
Houghton, (Mrs.) H. C. (FS) Gen. Fed. Women's Clubs, Washington, D. C.
Housel, E. L. (FC) Philadelphia, Pa.
Houston, H. E. (M) Tech. Cooperation Mission to India, New Delhi, India
Howard, J. C., Jr. (FC) Summit, N. J.
Howell, T. H. (FC) London, England
Hueper, W. C. (FC) Bethesda, Md.
Huff, Florence M. (M) Washington, D. C.
Huffman, J. W. (FC) Chicago, Ill.
Huggins, Eleita (M) Hudson Falls Nursing Home, Hudson Falls, N. Y.
Hundley, J. R. (M) Ladue, Mo.
Hunsaker, H. (M) Purdue U., Lafayette, Ind.
Hunter, W. W. (FP) U. Mich., Ann Arbor
Hursh, J. B. (FB) U. Rochester, Rochester, N. Y.
Hurwitz, I. M. (FC) Cape Town, South Africa
Hutton, J. H. (FC) Chicago, Ill.
Hymovich, L. (FC) Stanford, Conn.

Inglis, W. D. (C) Columbus, Ohio
Ingram, Vivian (G) St. Barnabas Hosp., New York City
Ivanko, M. B. (FS) Cleveland, Ohio

Jackman, W. C. (FS) Mather Home, Evanston, Ill.
Jackson, A. (M) Welf. Plan. Counc., Miami, Fla.
Jackson, H. C. (FS) Stephen Smith Home for Aged, Philadelphia
Jackson, W. A. (FS) Berkeley, Calif.
Jacobs, H. L. (M) Fort Dodge, Iowa
Jacobs, (Mrs.) L. L. (M) Dallas Home for Jewish Aged, Dallas, Texas
Jacobsen, C. (FP) State U. N. Y., Albany
Jacobson, S. D. (FC) Wayne County Gen. Hosp., Eloise, Mich.
Jahn, J. A. (M) New York City
Jalavisto, Eeva (FB) Yliopiston Fysiologinen Laitos, Helsinki, Finland
Janowsky, S. (FC) Victoria, B. C., Canada
Jansma, Harriet F. (M) Isabella Home for Aged Women, Grand Rapids, Mich.
Jarvis, H. G. (FC) West Hartford, Conn.
Jeffers, Frances C. (FP) Duke U. Med., Durham, N. C.
Jeghers, H. J. (FC) Seton Hall Coll. Med., Jersey City, N. J.
Jendron, R. C. (M) Burroughs Corp., Detroit, Mich.
Jensen, L. (FC) Vet. Admin. Hosp., Hines, Ill.
Jentgen, L. N. (G) Columbus, Ohio
Jewett, Ruth S. (FC) Winter Park, Fla.
Joel, W. (FB) Oklahoma City, Okla.
Johnson, G. E. (FS) Equity Annuity Life Ins. Co., Washington, D. C.
Johnson, R. O. (M) Iowa City, Iowa
Johnson, W. M. (M) Bowman Gray Med., Winston-Salem, N. C.
Jones, A. W. (M) Moosehaven Res. Lab., Orange Park, Fla.
Jones, H. E. (FP) U. Calif., Berkeley
Jones, J. T. (M) Gladstone, Mich.
Jones, T. L. (G) Dallas, Texas

Kahn, D. F. (FP) Lexington Sch. for Deaf, New York City
Kahn, Mercia L. (M) Soc. Sec. Admin., San Francisco, Calif.
Kahn, R. L. (M) U. Mich. Med., Ann Arbor
Kahn, S. S. (G) Dallas, Texas
Kallmann, F. J. (FB-FC) New York City
Kamellin, (Mrs.) S. M. (G) Cleveland, Ohio
Kamin, H. N. (FC) Chicago, Ill.
Kaplan, H. (M) Phoenix, Ariz.
Kaplan, J. (FS) Hennepin County Welf. Bd., Minneapolis
Kaplan, O. J. (FP) San Diego State Coll., San Diego, Calif.
Karelas, G. W. (FC) Newberry, Fla.
Karsten, Anitra L. C. (FP) Helsingfors, Finland
Kass, A. (FC) Detroit, Mich.
Kassel, V. (FC) Salt Lake City, Utah
Katz, L. N. (FB) Michael Reese Hosp., Chicago, Ill.
Kaufman, W. (FC-FP) Bridgeport, Conn.
Kearns, J. E. (FC) Evanston, Ill.
Kehlmann, W. H. (FS) Brooklyn, N. Y.
Kelchner, C. H. (M) Allentown, Pa.
Kelley, E. H. (FC) Neskowin, Oregon
Kelly, H. T. (M) Philadelphia, Pa.
Kempf, Florence C. (G) Mich. State U., East Lansing
Kempf, J. M. (FS) Arlington Heights, Ill.
Kenagy, H. G. (G) Texas Agric. & Mech. Coll., College Sta.
Kendig, Isabelle V. (G) Nat. Inst. Ment. Health, Bethesda, Md.
Ketchum, Nina (G) Williamston, Mich.
Keys, A. (FB) U. Minn., Minneapolis
Kheim, T. (FC) Washington U. Med., St. Louis, Mo.
King, D. C. (M) East Hartford, Conn.
King, Frances (FS) Sirovich Day Cen., New York City
Kinsley, S. (FS) Passaic, N. J.
Kirby, Mary L. (M) St. Louis, Mo.
Kirk, J. E. (FB-FC) Washington U. Med., St. Louis, Mo.
Kirshen, M. M. (FC) Chicago, Ill.
Kissane, R. W. (FC) Columbus, Ohio
Kleemeier, R. W. (FP) Moosehaven Res. Lab., Orange Park, Fla.
Klein, P. (FP) Harcum Jr. Coll., Bryn Mawr, Pa.
Klement, W. W. (FC) Cincinnati, Ohio
Klingenstein, (Mrs.) J. (M) New York City
Klingsberg, J. (M) Bethpage, N. Y.
Kloss, R. G. (FC) Paradise, Calif.
Klumpp, T. G. (FC) New York City
Knebel, L. M. (M) College Park, Md.
Knisely, W. H. (G) Duke U. Med., Durham, N. C.
Knopf, Olga (FC) New York City
Knowles, R. C. (FC) Minnehaha County Ment. Health Cen., Sioux Falls, S. D.
Koenigsberg, S. (M) Jewish Soc. Serv. Bur., Detroit, Mich.
Kohler, L. H. (FC) St. Louis, Mo.
Korenchevsky, V. (FB-FC) Whittington Hosp., London, England
Kountz, W. B. (FC) St. Louis, Mo.
Kountz, (Mrs.) W. B. (G) St. Louis, Mo.
Kraemer, Dorothy M. (FB) College Point, L. I., N. Y.
Krag, C. L. (FC) Stockton State Hosp., Stockton, Calif.
Kral, V. A. (M) McGill U., Montréal, Canada
Krause, J. C. (G) Penn Mutual Life Ins. Co., Lansing, Mich.
Kreger, A. (G) John B. Stetson Co., Philadelphia
Krieger, Virginia W. (M) Ferguson, Mo.
Kristeller, Edith L. (FC) New York City
Kruesi, O. R. (M) Bernardsville, N. J.
Kuhlen, R. G. (FP) Syracuse U., Syracuse, N. Y.
Kummerow, F. A. (M) U. Ill., Urbana
Kumnick, Lillian S. (M) New York City
Kuplan, L. (FS) Sacramento, Calif.
Kushner, Rose E. (FP) Great Neck, L. I., N. Y.
Kutak, R. I. (FP) U. Louisville, Louisville, Ky.

Labecki, T. D. (FC) Jackson, Miss.
La Belle, G. C. (FC) Rome, N. Y.
Ladd, Mary B. (FP) Cold Spring Proj., Cold Spring-on-Hudson, N. Y.
Lakritz, J. B. (FP) New York City
Laks, L. (M) Brooklyn, N. Y.
LaLonde, J. F. (M) E. H. Rowley Co., Lansing, Mich.
Lamb, C. A. (FC) Franklin Sch. for Adults, Los Angeles
Lambert, B. W. (FP) New York City
Landau, Gertrude (FS) Bronx, N. Y.
Lander, Adolfina (FS) Caracas, Venezuela
Landowne, M. (FB) Baltimore City Hosps., Baltimore, Md.
Langenbacher, A. (M) Lansing, Mich.
Langner, P. H. (FC) Provident Mutual Life Ins. Co., Philadelphia
Langsdorf, D. S. (M) Bank of Am., San Francisco, Calif.
Lansing, A. I. (FB) U. Pittsburgh Med., Pittsburgh, Pa.
Larknis, G. (FC) Melbourne, Australia
Larson, L. E. (FS) Community Serv. Soc., Red Hook, N. Y.
Larson, Neota (M) Bur. Old Age & Surv. Ins., Baltimore, Md.
Larson, R. T. (FC) Biscayne Hosp., Miami, Fla.
Lascalea, M. (FC) Buenos Aires, Argentina

Lash, A. F. (FC) Chicago, Ill.
Latham, C. G. (FP) Salt Lake City, Utah
Latimer, M. W. (FP) Washington, D. C.
Lase, Helen G. (FS) Welf. Counc. Metropol. Chicago, Chicago
Laugier, H. (M) U. Paris, Paris, France
Laursen, T. J. S. (FC) Gentofte, Denmark
Lawson, Grace (M) Los Angeles, Calif.
Lawton, R. W. (FB) U. S. Naval Air Dev. Cen., Johnsville, Pa.
Leake, C. D. (FB) Ohio State U., Columbus
LeClerc, J. A. (M) Starke, Fla.
Lee, Annabelle L. (G) Worcester, Mass.
Lee, J. P. (FS) Bd. of Pensions, Presbyterian Church in the U. S. A., Philadelphia, Pa.
Lee, Roger I. (FC) Boston, Mass.
Lee, Russel V. (FC) Palo Alto, Calif.
Leeds, M. (FS) Borinstein Home for Aged, Indianapolis, Ind.
Leopold, I. H. (M) Philadelphia, Pa.
Lesnick, G. J. (FC) New York City
Leuchtenberger, R. G. H. (M) Doctors Hosp., Cleveland Heights, Ohio
Lev, M. (FB) Mt. Sinai Hosp., Miami Beach, Fla.
Levenson, B. (M) Northwest Home for Aged, Chicago, Ill.
Levin, M. L. (FS) Albany, N. Y.
Levine, A. J. (FP) Brooklyn, N. Y.
Levine, H. (FS) Dept. Welf., New York City
Levitt, A. (FC) Brooklyn, N. Y.
Lewis, (Mrs.) J. T. (FS) New York City
Lewis, W. H., Jr. (FC) New York City
Lieb, C. W. (FC) Rancho Santa Fé, Calif.
Liefmann, R. (FC) Beaurepaire, Que., Canada
Light, A. E. (G) Yonkers, N. Y.
Lindberg, B. A. (FS) U. Alberta, Edmonton, Alb., Canada
Linden, M. E. (FP) Philadelphia, Pa.
Lindquist, J. N. (FC) Wynnewood, Pa.
Lindsey, Marian S. (FS) Kirkwood, Mo.
Ling, Shata L. (FS) Ann Arbor, Mich.
Lingle, K. I. (M) Chicago, Ill.
Lipitz, E. J. (FS) Catonsville, Md.
Lippold, J. A. (M) Aurora, Ill.
List, M. D. (M) New York City
Littauer, D. (FC) Jewish Hosp., St. Louis, Mo.
Little, Mary H. (FS) Belleville, Ill.
Littlefield, D. C. (FC) Long Beach, Calif.
Lloyd, R. McA. (FS) Teachers Ins. & Annuity Assn., N. Y. C.
Lloyd, W. H. (M) Manchester, England
Loeb, M. B. (FP) Comm. on Human Dev., Kansas City, Mo.
Loewenberg, I. S. (FS) Chicago, Ill.
Logan, M. A. (FB) U. Cincinnati Med., Cincinnati, Ohio
Lokshin, Helen (M) Brooklyn, N. Y.
Lombardi, A. A. (FC) New York City
Lorge, I. (FP) Columbia U., New York City
Lorton, Mary (FP) Belleville, Ill.
Lowry, O. H. (FB) Washington U. Med., St. Louis, Mo.
Lund, H. (M) Higganum, Conn.
Lyon, Florence (G) Welf. Counc., Winnipeg, Man., Canada

Macdonald, R. I. (FC) Toronto, Canada
MacDougall, W. A. (M) Kansas City, Mo.
MacKenzie, H. S. (G) Chicago, Ill.
Mack, Margery J. (FP) Chicago, Ill.
Mack, Pauline B. (M) Texas State Coll. for Women, Denton
MacNeill, Florence R. (FC) Minneapolis, Minn.
Macquin, Hazelle B. (FP) U. Utah, Salt Lake City
Madar, Olga N. (FS) UAW-CIO, Detroit, Mich.
Maddaloni, A. (M) Stamford, Conn.
Mainland, D. (FB) N. Y. U. Med., New York City
Malinow, M. R. (M) Buenos Aires, Argentina
Mallas, A. A., Jr. (G) Austin, Texas
Maller, J. B. (FP) New York City
Mallery, O. T., Jr. (FC) U. Hosp., Ann Arbor, Mich.
Maloney, A. P. (FS) Hazleton, Pa.
Maluf, N. S. R. (M) Los Angeles, Calif.
March, Dorothy L. (M) Swarthmore, Pa.
Marcus, (Mrs.) S. (G) N. Y. State Fed. Women's Clubs, Ossining
Marin, F. (M) Lansing, Mich.
Marmorston, J. (M) Los Angeles, Calif.
Mars, G. (FB-FC) Milan, Italy
Marshall, E. A. (FC) Cleveland, Ohio
Martin, K. E. (FC) Cincinnati, Ohio
Martin, S. L. (M) Methodist Home, Indianapolis, Ind.
Martini, Catherine (M) Washington, D. C.
Martorell, F. (FC) Inst. Policlínico, Barcelona, Spain
Maskrey, Margaret S. (M) Theresa Grotta Home, Caldwell, N. J.
Master, A. M. (FC) New York City
Masters, E. W. (FC) Columbia, S. C.
Masters, W. H. (FC) Washington U. Med., St. Louis, Mo.
Mathews-Trueman, (Mrs.) B. (G) Florence, S. C.
Mathiasen, Geneva (FS) Nat. Soc. Welf. Assembly, N. Y. C.
Matuoka, S. (FC) U. Tokyo, Tokyo, Japan
Matzner, J. A. (M) Dallas, Texas
Maves, P. B. (FS) Drew U., Madison, N. J.
McCallum, J. A. (FC) Montebello Hosp., Baltimore, Md.
McCarver, J. W. (G) Los Angeles, Calif.
McCay, C. M. (FB) Cornell U., Ithaca, N. Y.
McCord, D. W. (G) Dallas, Texas
McCoy, Georgia F. (FS) Dept. Health, Ed., & Welf., Washington, D. C.
McCullagh, E. P. (FC) Cleveland Clinic Fd., Cleveland, Ohio
McFarland, R. A. (FB-FC) Harvard U. Med., Boston, Mass.
McGavack, T. H. (FB) N. Y. Med., New York City
McKain, W. C., Jr. (FP) U. Conn., Storrs
McKinney, Margaret E. (M) McKinney's San., Yonkers, N. Y.
McLaughlin, Elizabeth K. (M) Vet. Admin. Cen., Jackson, Miss.
McMahon, J. F. (FS) Volunteers of Am., New York City
McQuillan, J. R. (FC) Vet. Admin. Cen., Fort Harrison, Mont.
Mead, S. (FC) Calif. Rehabil. Cen., Vallejo
Medalia, L. S. (FB) Boston, Mass.
Meier, R. (FB) Ciba Ltd., Basel, Switzerland
Melvin, Blanche M. (FP) McLean, Va.
Meng, H. C. (M) Vanderbilt U. Med., Nashville, Tenn.
Menninger, Karl (FC) Menninger Clinic, Topeka, Kans.
Mensh, I. N. (M) Washington U. Med., St. Louis, Mo.
Merriam, (Mrs.) A. (G) Dallas, Texas
Miernyk, W. H. (M) Northeastern U., Boston, Mass.
Migden, J. I. (FC) New York City
Miles, W. R. (FP) Istanbul U., Istanbul, Turkey
Millard, (Mrs.) C. (G) Bellaire, Mich.
Miller, Carmen (G) U. Texas Southwestern Med., Dallas
Miller, Dorothy A. (M) Windsor, Ont., Canada
Miller, F. D. (FB) Altoona, Pa.
Miller, (Mrs.) G. (G) Fed. Jewish Philanthropies, Pittsburgh
Miller, L. (M) Jewish Mem. Hosp., New York City
Milliken, F. B. (G) Kansas City, Mo.
Miltonberger, (Mrs.) J. F. (G) Mobile, Ala.
Moates, G. E. (G) Fla. State Dept. Educ., Tallahassee
Mohr, F. L. (FC) Ciba Pharm. Prod., Summit, N. J.
Moncrieff, Kathleen G. (M) Cadillac Nursing Home, Detroit, Mich.
Monroe, R. T. (FC) Boston, Mass.
Montgomery, J. D. (M) United Christian Miss. Soc., Indianapolis
Montoye, H. J. (FB) Mich. State Coll., East Lansing
Moore, E. E. (M) U. S. Steel Co., Pittsburgh, Pa.
Moore, Madeline U. (FS) Community Serv. Soc., New York City
Moore, R. A. (FB) U. Pittsburgh Med., Pittsburgh, Pa.
Moran, T. J. (FB) Presbyterian Hosp., Pittsburgh, Pa.
Morgan, J. E. (M) Senior Citizens of Am., Washington, D. C.
Morris, W. W. (FP) State U. Iowa Med., Iowa City
Morrison, Effie M. (M) Millville, N. J.
Morrison, L. M. (FC) Los Angeles, Calif.
Moses, C. (FC) U. Pittsburgh Med., Pittsburgh, Pa.
Moss, Ethel C. (G) New Lothrop, Mich.
Mother M. Aloysius (M) St. Patrick's Home, Bronx, N. Y.
Mother M. Angeline Teresa, O. Carm. (M) St. Teresa's Motherhouse, Germantown, N. Y.
Mother M. Bernadette de Lourdes (FS) Mary Manning Walsh Home, N. Y. C.
Mother M. Josita (M) Josephine Baird Home, New York City
Mother Marie de Lourdes (M) Mt. Carmel Home, New York City
Mother Mary Concordia (FS) St. Mary of the Angels, St. Louis, Mo.
Mount, C. J. (FC) Los Angeles, Calif.
Muelder, M. E. (M) Mich. State Coll., East Lansing
Mueller, Emily E. (M) Philadelphia, Pa.
Mueller-Deham, A. (FC) New York City
Muhlberg, W. (FS) Cincinnati, Ohio
Mulholland, Elizabeth A. (M) Bur. Old Age & Surv. Ins., Baltimore
Mulholland, H. B. (M) Charlottesville, Va.
Mulvey, (Mrs.) G. F. (M) Providence, R. I.
Mumma, Marjory E. (M) Mt. Morris, Ill.
Munter, E. J. (FC) San Francisco, Calif.
Murphy, Elaine F. (M) J. L. Hudson Co., Detroit, Mich.
Murphy, W. T. (M) Newton, Mass.
Murray, G. (M) Catholic Charities, New York City
Murray, I. MacK. (FB) State U. N. Y. Med., Brooklyn
Myers, A. F. (FP) N. Y. U., New York City
Myers, Anna S. (FS) Wynnewood, Pa.

Nagel, H. (FC) Levindale Hebrew Home & Infirm., Baltimore
Nagy, Elsie R. (FS) Elmhurst, N. Y.
Nayvar, S. N. (FB) U. Minn., Minneapolis
Necheles, H. (FB-FC) Chicago, Ill.
Nelson, A. M. (FC) Seattle, Wash.
Nelson, M. (FC) National City, Calif.
Neugarten, Bernice L. (FP) Chicago, Ill.
Newell, R. R. (FC) Stanford U. Med., San Francisco, Calif.
Newman, G. (G) Jewish Home for Aged, Detroit, Mich.
Newmark, L. (FS) Jewish Home for Aged, Atlanta, Ga.
Ney, C. (FC) New York City
Nichol, E. S. (FC) Miami, Fla.
Nixon, W. B. (M) Dyersburg, Tenn.
Noetzel, A. J., Jr. (FP) John Carroll U., Cleveland, Ohio
Norris, A. H. (FB) Baltimore City Hosps., Baltimore, Md.
Novey, J. (G) Coldwater Mem. Hosp., New York City
Noyes, Helen (FS) Louisville, Ky.
Nystrom, P. H. (FC-FP) Spring Valley, N. Y.

Obrist, W. D. (FB) Inst. of Living, Hartford, Conn.
O'Donovan, C. J. (M) Kalamazoo, Mich.
Ogden, E. (FB) Ohio State U., Columbus
O'Grady, J. (FS) Nat. Conf. Catholic Char., Washington, D. C.
Ohmoto, M. (FC) St. Louis, Mo.
Olbrich, O. (FC) Gen. Hosp., Sunderland, England
Olsen, Inger (M) Copper Mountain, B. C., Canada
O'Rear, E. P. (M) Los Angeles, Calif.

Osgood, (Mrs.) T. H. (M) — East Lansing, Mich.
Ostomel, M. J. (FS) — Welf. Planning Counc., Los Angeles, Calif.
Oxley, Lucy O. (FC) — Cincinnati, Ohio

Page, H. F. (FC) — Philadelphia, Pa.
Page, I. H. (FB) — Cleveland, Ohio
Panella Casas, M. (FC) — Barcelona, Spain
Papez, J. W. (FB-FC) — Columbus State Hosp., Columbus, Ohio
Parfentjev, I. A. (FB) — Yale U. Med., New Haven, Conn.
Parker, M. M. (FC) — Columbus, Ohio
Parkhurst, L. W. (M) — Philadelphia, Pa.
Parramore, Grace R. (M) — Crown Point, Ind.
Parrett, Myra L. (G) — Tecumseh, Mich.
Paul, M. S. (M) — Chicago, Ill.
Pauncz, A. (FC) — Vet. Admin. Hosp., Downey, Ill.
Payno, M., Jr. (FC) — México, D. F., México
Pearce, C. A. (FP) — N. Y. State Dept. Labor, N. Y. C.
Pearlman, S. L. (FC) — Chicago, Ill.
Pearlstein, M. (M) — Jewish Home for Aged, Miami, Fla.
Pequeño, E. A. (FB) — U. Nuevo León, Monterrey, México
Perkins, R. B. (G) — Dept. Health, Ed., & Welf., Washington, D. C.
Perkins, Viola (FS) — E. D. Farmer Fd., Dallas, Texas
Perlin, S. (G) — Nat. Inst. Ment. Health, Bethesda, Md.
Perlman, R. M. (FC) — San Francisco, Calif.
Peterson, P. D. (M) — Welf. Off., Gettysburg, S. D.
Peterson, R. L. (FP) — Greenwich, Conn.
Pfeiffer, H. H. (FB) — Lab. f. Polar-Mikrosko., Bremen, Germany
Pfeiffer, Mildred C. J. (FC) — Merion Station, Pa.
Phillips, H. (FP) — East St. Louis, Ill.
Pickell, F. W. (FC) — Baton Rouge, La.
Pickhardt, O. C. (FC) — New York City
Piersol, G. M. (FC) — Wynnewood, Pa.
Pilgeram, L. O. (FB) — Stanford U., Stanford, Calif.
Pincus, G. (FB) — Worcester Fd. Exper. Biol., Shrewsbury, Mass.
Pittard, (Mrs.) M. C. (M) — Decatur, Ga.
Platner, Natalie (G) — Toronto, Canada
Plimpton, C. H. (FC) — Columbia-Presbyterian Med. Cen., N. Y. C.
Pogge, R. C. (FC) — Wm. Merrell Co., Cincinnati, Ohio
Pollack, H. (FC) — New York City
Pollack, M. A. (FB) — Morris Plains, N. J.
Pollak, O. J. (FB) — Dover, Dela.
Pollak, Otto (FP) — U. Pa., Philadelphia
Pomerance, J. B. (FC) — Miami Beach, Fla.
Pomeranze, J. (FC) — New York City
Pomrinse, S. D. (M) — Dept. Health, Ed. & Welf., Washington, D. C.
Poole, Catheryn (M) — Troy, N. Y.
Poole, Elma (M) — St. Louis, Mo.
Pope, F. E. (FC) — Long Island City, N. Y.
Posey, A. Margaret (FC) — Cincinnati, Ohio
Posey, W. H. (G) — Ohio Citizens Counc. Health & Welf., Columbus
Posner, W. (FS) — Jewish Comm. Serv., Bayside, N. Y.
Pottenger, F. V. (FC) — Pottenger San., Monrovia, Calif.
Potter, W. H. (FC) — Memorial Hosp., Harlan, Ky.
Potts, Jane H. (G) — East Lansing, Mich.
Powell, Amy S. (FS) — Family Serv. Assn., Boston, Mass.
Prados, M. (FP) — Montréal, Canada
Pratt, L. A. (FC) — Detroit, Mich.
Pressey, S. L. (FP) — Ohio State U., Columbus
Price, A. H. (FC) — Mich. State Med. Soc., Detroit
Prickett, C. J. (FC) — Dela. State Welf. Home, Smyrna
Prudente, A. (FC) — São Paulo, Brazil
Prussin, Dorothy V. (FS) — New York City
Pulse, Irene R. (G) — East Lansing, Mich.

Quigley, J. P. (FB) — U. Tenn., Memphis
Quintero Quintero, J. (FC) — Caracas, Venezuela

Raab, W. (FC) — U. Vt. Med., Burlington
Rachofsky, (Mrs.) O. E. (G) — Dallas, Texas
Raible, Mildred G. (G) — Counc. Soc. Agencies, Dallas, Texas
Railey, Elma P. (G) — Pine Forest Rest, Inc., Potecasi, N. C.
Raisbeck, M. J. (FC) — New York City
Ramsey, W. A., Jr. (FB) — Cayce, S. C.
Ranck, Margaret (FS) — Carthage, Ill.
Randall, Ollie A. (FS) — Community Serv. Soc., New York City
Rank, Betty J. (M) — Oakland, Calif.
Rathbun, H. K. (FC) — Baldwin, Md.
Rathe, H. W. (FC) — Rohlf Mem. Clinic, Waverly, Iowa
Ravdin, I. S. (FC) — U. Hosp., Philadelphia, Pa.
Ravetz, E. (M) — Philadelphia, Pa.
Ravin, L. H. (M) — Dept. Health, Ed., & Welf., Washington, D. C.
Ravner, Pearl C. (G) — Aceokeck, Md.
Rawls, W. B. (FC) — New York City
Reals, W. H. (FP) — Washington U., St. Louis, Mo.
Rechtman, A. M. (M) — Albert Einstein Med. Cen., Philadelphia
Redisch, W. (FC) — New York City
Reebel, Katherine R. (FS) — U. Mich., Ann Arbor
Reeve, G. H. (FP) — Cleveland, Ohio
Reich, S. B. (FC) — Hackensack, N. J.
Reifenstein, E. C., Jr. (FC) — Butler, N. J.
Reitan, R. M. (FP) — Ind. U. Med., Indianapolis
Remmers, H. H. (M) — Purdue U., Lafayette, Ind.
Remsen, D. B. (FC) — Squibb Inst. Med. Res., New Brunswick, N. J.
Rendl, Mildred (FP) — Long Island City, N. Y.
Repasky, J. (FC) — Akron, Ohio
Reynolds, Mildred M. (FS) — Purdue U., Lafayette, Ind.
Rhoads, J. E. (FB-FC) — Philadelphia, Pa.
Rich, J. R. (G) — J. B. Roerig & Co., Chicago, Ill.
Richmond, M. B. (FC) — Dallas, Texas
Ring, G. C. (FB) — U. Miami Med., Coral Gables, Fla.
Ringe, Helen H. (M) — Washington, D. C.
Roberts, A. F. (G) — Family Serv., Miami, Fla.
Roberts, S. (FS) — Rosa Coplon Jewish Old Folks Home, Buffalo, N. Y.
Robillard, E. (M) — U. Montréal, Montréal, Canada
Robinson, G. W., Jr. (FB) — Kansas City, Mo.
Robinson, Hope G. (FP) — Long Beach, Calif.
Roche, M. B. (FC) — St. Louis, Mo.
Rockstein, M. (FB) — N. Y. U. Med., New York City
Roen, P. B. (FC) — Los Angeles, Calif.
Rogers, J. B. (FB) — U. Louisville, Louisville, Ky.
Rogers, M. (G) — Dept. Health, Ed., & Welf., Washington, D. C.
Rogers, W. F. (M) — Fulton, Mo.
Rome, Natalie (M) — West Hartford, Conn.
Roofe, P. G. (M) — U. Kans., Lawrence
Ropes, Marian W. (FC) — Mass. Gen. Hosp., Boston
Rorem, C. R. (FS) — Philadelphia, Pa.
Rosenberg, Alice D. (M) — New York City
Rosenberg, G. (M) — Montréal, Canada
Rosenberry, B. F. (FC) — Palmerton, Pa.
Rosenthal, F. H. (FS) — Jewish Home for Aged, Pittsburgh, Pa.
Ross, A. (M) — New York City
Ross, M. (M) — Beverly Hills, Calif.
Ross, S. S. (G) — Sidney S. Ross Co., New York City
Rossiliano, Anna K. (FC) — New York City
Roth, M. (M) — Brooklyn Hebrew Home & Hosp. for Aged, Brooklyn, N. Y.
Rothermel, R. E. (FP) — Am. Heart Assn., New York City
Rothschild, D. (FC) — Newton, Mass.
Rothschild, K. (FC) — Plainfield, N. J.
Rouse, M. O. (M) — Dallas, Texas
Rudin, E. H. (FS) — Jewish Home for Aged, Rochester, N. Y.
Rudzinska, Maria A. (FB) — Rockefeller Inst. Med. Res., N. Y. C.
Ruggles, (Mrs.) W. B. (G) — Dallas, Texas
Rutherford, W. L. (FP) — Peoria, Ill.
Ryan, J. M. (G) — Detroit, Mich.
Ryder, Claire F. (FC) — Geriatrics Unit, Boston, Mass.

Sackler, A. M. (FC) — New York City
Sadler, (Mrs.) R. P. (G) — Charlotte, N. C.
Sadow, H. S. (M) — Lakeside Labs., Milwaukee, Wisc.
Salamone, A. (FP) — St. Louis U., St. Louis, Mo.
Salon, N. L. (M) — Fort Wayne, Ind.
Samaras, S. C. (FB) — Creighton U. Med., Omaha, Nebr.
Samuels, S. S. (FC) — New York City
Sanderson, Virginia S. (FP) — Ohio State U., Columbus
Sardo, J. (G) — Franklin Square, N. Y.
Sauer, W. N. (FC) — St. Louis, Mo.
Saunders, H. W. (FP) — Iowa City, Iowa
Schaie, K. W. (M) — U. Wash., Seattle
Schatz, A. (M) — Oreland, Pa.
Schaus, R. (FC) — Grand Duchy of Luxembourg
Scheier, (Mrs.) A. (M) — Peninsula Volunteers, Menlo Park, Calif.
Schermerhorn, Helen M. (M) — Schermerhorn Nursing Homes, Albany, N. Y.
Schiffrin, M. J. (M) — Chicago, Ill.
Schoonover, Maurine S. (G) — Fort Worth, Texas
Schraer, H. (FB) — Pa. State U., University Park
Schroeder, H. A. (FC) — Washington U. Med., St. Louis, Mo.
Schronce, Julia (G) — Charlotte, N. C.
Schueler, Julia (M) — Iowa City, Iowa
Schuom, Margaret E. (G) — East Lansing, Mich.
Schuster, D. B. (FP) — Strong Mem. Hosp., Rochester, N. Y.
Schweitzer, M. D. (M) — New York City
Scriba, Isabel (M) — Retirement Counc., New York City
Seidel, H. (FC) — Baltimore, Md.
Selvidge, L. (M) — Olympia, Wash.
Severinghaus, E. L. (FC) — Essex Fells, N. J.
Shafer, Kathleen N. (FP) — Elizabeth, N. J.
Shanas, Ethel (FP) — Evanston, Ill.
Shank, J. B. (M) — St. Louis Chronic Hosp., St. Louis, Mo.
Shank, R. E. (FC) — Washington U. Med., St. Louis, Mo.
Shapiro, A. (FC) — Brooklyn, N. Y.
Shearer, F. (FS) — Bd. Soc. Missions, New York City
Sheinin, J. J. (FC) — Chicago, Ill.
Sheps, J. (M) — New York City
Sherman, E. D. (FC) — Montréal, Canada
Sherson, J. S. (FC) — Malvern, Pa.
Shettel, R. (FC) — Allentown State Hosp., Allentown, Pa.
Shimoda, May M. (M) — Fort Douglas, Utah
Shipman, P. A. (M) — Masonic & Eastern Star Home, Forest Grove, Oregon
Shipps, G. L. (G) — Midland, Mich.
Shock, Margaret T. (G) — Baltimore, Md.
Shock, N. W. (FB) — Baltimore City Hosps., Baltimore, Md.
Shockey, R. I. (G) — Moorestown, N. J.
Shore, H. (FS) — Dallas, Texas
Shore, M. J. (M) — New York City

Shorney, M. P. (FC) Columbia U. Med. Cen., N. Y. C.
Short, R. A. (M) Presbyterian Home, High Point, N. C.
Shreiner, J. H. (M) Towers, Perrin, Forster & Crosby, Inc., Philadelphia, Pa.
Siegal, Zuzie (M) Mt. Vernon, N. Y.
Sifre, R. A. (FC) Santurce, Puerto Rico
Sigurbjornsson, G. (FS) Elli—Old Folks Home, Reykjavik, Iceland
Silberberg, M. (FC) St. Louis, Mo.
Silberberg, Ruth (FC) St. Louis, Mo.
Silverman, H. L. (FP) Newark, N. J.
Silverstein, A. (M) Brooklyn, N. Y.
Simerville, Clara L. (FP) Corvallis, Oregon
Simms, H. S. (FB) Coll. Phys. & Surg., New York City
Simon, Charlotte B. (FS) Bayonne, N. J.
Simonson, E. (FC) U. Minn., Minneapolis
Sindoni, A., Jr. (FC) Philadelphia, Pa.
Singher, H. O. (M) Ortho Res. Fd., Raritan, N. J.
Sison, A. B. M. (FC) U. Philippines Med., Manila
Sister M. Ruth Herron (FS) Mt. Alveano Home for Aged, Clinton, Iowa
Sladen, F. J. (FC) Henry Ford Hosp., Detroit, Mich.
Slater, L. B. (FP) Lincoln Inst., Miami Beach, Fla.
Slaughter, S. B., Jr. (FC) Vet. Admin. Hosp., Waco, Texas
Slonaker, L. C. (FS) Mather Home, Evanston, Ill.
Smith, C. A. H. (FB) New York City
Smith, D. R. (FC) Mem. Hosp., Iron Mountain, Mich.
Smith, E. M. (FC) Hot Springs, Ark.
Smith, I. (FS) Community Chest, San Francisco, Calif.
Smith, Joan M. (FS) Verdun Protestant Hosp., Montréal, Canada
Smith, L. W. (FB-FC) New York City
Smith, Marian (M) Christ Church Hosp., Philadelphia, Pa.
Smith, (Mrs.) R. A. (G) Lansing, Mich.
Smith, W. R. (M) Pasadena, Calif.
Snider, R. S. (G) Northwestern U., Chicago, Ill.
Snyder, N. A. (M) Jewish Home for Aged, Los Angeles, Calif.
Sobel, H. (FB) Cedars of Lebanon Hosp., Los Angeles
Soderwall, A. L. (FB) U. Oregon, Eugene
Sohlberg, O. I. (FC) St. Paul, Minn.
Soncini, T. M. (M) Ciudad Trujillo, Dominican Republic
Sonnenblick, I. I. (FS) Jewish Home for Aged, Detroit, Mich.
Sonquist, D. E. (M) Chicago, Ill.
Sontag, L. W. (FP) Antioch Coll., Yellow Springs, Ohio
Soop, E. J. (M) U. Mich., Ann Arbor
Sorter, Hertha (FC) Chicago, Ill.
Sosa, J. M. (FB) Fac. Humanid. y Cienc., Montevideo, Uruguay
Souto, J. (FC) Inst. Med. Exper., Caracas, Venezuela
Spealman, Clair R. (M) Civil Aeronaut. Admin., Washington, D. C.
Spector, S. (M) Counc. State Governments, Chicago, Ill.
Spies, T. D. (FB-FC) Hillman Hosp., Birmingham, Ala.
Spoto, J. S. (FC) St. Petersburg, Fla.
Sprague, H. B. (FC) Brookline, Mass.
Sprunt, D. H. (M) U. Tenn., Memphis
Stafford, Virginia (FP) Gen. Bd. of Educ. Methodist Church, Nashville, Tenn.
Stair, (Mrs.) H. A. (G) Alexandria, Ohio
Stanton, Jeannette E. (FP) Ohio Wesleyan U., Delaware
Stanton, L. W. (M) Chicago, Ill.
Stanton, W. E. (G) Wesley Gardens, Des Moines, Wash.
Staples, Ruth (FP) U. Nebr., Lincoln
Stark, H. R. (FC) San Marino, Calif.
Starr, P. (FC) Los Angeles County Gen. Hosp., Los Angeles
Steele, J. M. (FB) Goldwater Mem. Hosp., N. Y. C.
Stein, I. (M) Philadelphia, Pa.
Steinberg, A. (FC) Philadelphia, Pa.
Steindler, A. (FC) Mercy Hosp., Iowa City, Iowa
Stern, A. B. (FC) Brooklyn, N. Y.
Stern, K. (FC) Ottawa Gen. Hosp., Ottawa, Ont., Canada
Sternberg, F. (FC) Cleveland, Ohio
Stewart, H. J. (FC) New York City
Stieglitz, E. J. (FC) Washington, D. C.
Still, J. (FB) George Washington U. Med., Washington, D. C.
Still, (Mrs.) J. W. (M) Am. Nat. Red Cross, Washington, D. C.
Stone, Evelyn (M) Stone Nursing Home, St. Louis, Mo.
Storch, S. (FC) Jacksonville, Fla.
Strassmann, G. S. (FB) Metropol. State Hosp., Waltham, Mass.
Strother, C. R. (G) U. Wash., Seattle
Stubbs, J. B. (FC) Galveston, Texas
Studz, Helen (M) Vet. Admin. Hosp., Fort Howard, Md.
Sturgis, Louise L. (M) Am. Cancer Soc., New York City
Sturkie, P. D. (M) Rutgers U., New Brunswick, N. J.
Sulkin, N. M. (M) Bowman Gray Med., Winston-Salem, N. C.
Suntzeff, Valentina (FB) Washington U. Med., St. Louis, Mo.
Surtshin, A. (FB) Washington U. Med., St. Louis, Mo.
Suttenfield, F. D. (FC) Wiesbaden, West Germany
Suzman, M. M. (FC) Johannesburg, South Africa
Swaim, W. T., Jr. (FS) Dillsburg, Pa.
Swanson, Pearl P. (FB) Iowa State Coll., Ames
Swartz, F. C. (FC) Lansing, Mich.
Swartz, P. W. (FS) Cincinnati, Ohio
Switkes, H. (FC) Vet. Admin. Hosp., Pittsburgh, Pa.

Taietz, P. (FP) Cornell U., Ithaca, N. Y.
Talley, R. W. (M) Upjohn Co., Kalamazoo, Mich.
Tarrell, P. (FS) Jewish Community Cen., Chicago, Ill.
Taterka, J. H. (FC) New York City
Tauber, S. A. (M) Home for Jewish Aged, Philadelphia, Pa.
Taylor, H. L. (FB) U. Minn., Minneapolis
Taylor, Ida S. (M) Gordon Conval. & Rest Home, Washington, D. C.
Taylor, Margaret (G) Columbus, Ohio
Tefft, C. B. (G) Peoples Church, East Lansing, Mich.
Terman, M. A. (FS) Waveland Manor & Conval. Home, Chicago
Terrence, A. C. (FC) Opelousas, La.
Tews, Opal (G) Counc. House for Senior Citizens, Minneapolis
Thill, C. J. (FC) Oak Park, Ill.
Thomae, F. W., Jr. (FB) U. Texas, Austin
Thompson, Jane M. (G) Lansing, Mich.
Thompson, K. W. (FB) Organon, Inc., Orange, N. J.
Thompson, Lynn (G) Mitchellville, Iowa
Thompson, Phebe K. (FC) Chicago, Ill.
Thoms, E. J. (M) Manchester Mem. Hosp., Manchester, Conn.
Thoren, V. E. (G) Lutheran Minor Hosp., Puyallup, Wash.
Thornton, T. F. (FC) Waterloo, Iowa
Thuresson, P. F. (FC) Riverside, Calif.
Thurman, H. (G) Coral Gables, Fla.
Thurston, J. L. (FS) Larchmont, N. Y.
Tibbitts, C. (FP) Dept. Health, Ed., & Welf., Washington, D. C.
Tietz, Margaret (FS) N. J. Fellowship Fund, Newark
Tintera, J. W. (FC) Yonkers, N. Y.
Tishman, Rose F. (G) New York City
Tobler-Lennhoff, Alice B. (M) Md. State Dept. Health, Baltimore
Toosy, M. H. (FB) Nishtar Med. Coll., Multan, W. Pakistan
Towne, J. E. (G) East Lansing, Mich.
Traubner, H. (G) Charles Bierman Home for Aged People, Montclair, N. J.
Travers, M. H. (M) Vet. Admin. Hosp., Fort Howard, Md.
Truex, R. C. (FB) Hahnemann Med. Coll., Philadelphia, Pa.
Tuckman, J. (FP) Dept. Pub. Health, Philadelphia, Pa.
Tukey, H. H. (G) Cape Cod, Mass.
Tulin, Pearl (G) Brooklyn, N. Y.
Turell, R. (FC) New York City
Turner, H. H. (FC) Oklahoma City, Okla.
Turner, Helen (FS) Flushing, N. Y.
Tutles, A. J. (FP-FC) West Hartford, Conn.
Tuttle, W. K. (G) Dallas, Texas
Tyler, Lina W. (M) Flint Recreation & Park Bd., Flint, Mich.

Udell, L. (FC) Philadelphia, Pa.

Van Cleef, P. (G) Beverly Hills, Calif.
Van de Velde, J. J. A. (G) Ghent, Belgium
Van Dyke, J. H. (M) Hahnemann Med. Coll., Philadelphia, Pa.
Van Hoy, J. M. (FC) Charlotte, N. C.
Van Slyke, C. J. (FB-FC) Nat. Inst. Health, Bethesda, Md.
van Swol, E. (M) Alexandria, Va.
van Zonneveld, R. J. (FC) Groningen, Holland
Varchaver, Catherine (FP) Grand Rapids, Mich.
Velardo, J. T. (FB) Yale U. Med., New Haven, Conn.
Venable, G. M. (G) Columbus, Ga.
Verdone, G. F. (FC) Charlotte, N. C.
Vernier, Claire M. (FP) Vet. Admin. Hosp., Baltimore, Md.
Vest, W. E. (FC) Huntington, W. Va.
Vickery, Florence E. (FS) San Francisco Senior Cen., San Francisco
Villaume, W. J. (FS) Dept. Soc. Welf., New York City
Villegas, R. (M) Vanderbilt U. Hosp., Nashville, Tenn.
Visscher, M. B. (FB) U. Minn., Minneapolis
von Haam, E. (FB) Ohio State U., Columbus

Wachs, M. (M) Brooklyn, N. Y.
Wade, L. J. (FC) Esso Standard Oil Co., New York City
Wagner, A. (FC) Mather Home, Evanston, Ill.
Wagner, Margaret W. (FS) Banjamin Rose Inst., Cleveland, Ohio
Wagner, O. W. (G) St. Louis, Mo.
Wagner, Ruth E. (G) Royal Oak, Mich.
Waife, M. M. (M) Bronx, N. Y.
Wakefield, H. (FC) Chicago, Ill.
Wakerlin, G. E. (FB-FC) U. Ill. Med., Chicago
Walch, (Mrs.) J. J. (M) Mich. State Fed. Women's Clubs, Escanaba
Waldman, A. (M) Home for Jewish Aged, Philadelphia, Pa.
Walker, (Mrs.) M. C. (G) Cleveland, Ohio
Wallach, K. (FC) New York City
Walworth, G. (G) Tecumseh, Mich.
Warner, C., Jr. (FS) Warner Co., Philadelphia, Pa.
Warshawsky, Florence (FP) Cleveland, Ohio
Watkins, Eleanor M. (FP) New Haven, Conn.
Watson, R. I. (FP) Northwestern U., Evanston, Ill.
Waxter, T. J. S. (FS) Dept. Pub. Welf., Baltimore, Md.
Wayne, C. M. (FC) Los Angeles, Calif.
Wayne, G. J. (FC) Los Angeles, Calif.
Webber, I. L. (FP) U. Fla., Gainesville
Wechsler, D. (FP) New York City
Weigensberg, B. I. (M) McGill U., Montréal, Canada
Weil, J. (FS) Montefiore Home, Cleveland Heights, Ohio
Weiler, T. D. (G) East Cleveland, Ohio
Weinberg, J. (FC) Chicago, Ill.
Weinberg, P. (M) Chicago, Ill.
Weinrott, L. (M) Philadelphia, Pa.
Weinstein, J. (FC) Bronx, N. Y.
Weiss, H. G. (FC) Evansville, Ind.
Weissman, F. M. (M) New York City
Weissman, N. (M) Detroit, Mich.

Weitzner, H. A. (FC) Berkeley, Calif.
Welford, N. T. (M) U. W. Ontario, London, Canada
Wenk, E. L. (FC) Shreveport, La.
Wèpierre, R. (FC) Fac. Méd. Lille, Lille, France
Wershow, H. J. (G) Levindale Hebrew Home & Infirm., Baltimore, Md.
Werthessen, N. T. (FB) Southwest Fd. for Res. & Educ., San Antonio, Texas
West, C. A. (G) Peoria Journal Star, Peoria, Ill.
Wexler, L. (M) New York City
White, L. A. (G) Birmingham, Mich.
White, W. C. (M) New York City
Whitridge, Eugenia R. (G) Duke U., Durham, N. C.
Whyte, Margaret (G) Olympia, Wash.
Wiersma, S. C. (FC) Muskegon, Mich.
Wildman, (Mrs.) A. T. (G) Soc. Agencies of Dallas, Dallas, Tex.
Wilhelm, O. E. (FB) Inst. Biol., Concepción, Chile
Williams, J. N., Jr. (M) U. Wisc. Coll. Agric., Madison
Williamson, W. R. (FP) Washington, D. C.
Willis, E. S. (M) Gen. Electric Co., New York City
Wilner, Y. (M) King Street Home, Port Chester, N. Y.
Wilson, F. J. (M) Nat. Assn. Retired Civil Employ., Washington, D. C.
Wilson, Helen S. (G) U. N. H. Durham
Wilson, J. Walter (FB) Brown U., Providence, R. I.
Wilson, James C. (M) Houston, Texas
Wilson, P. A. (FS) Vocational Guidance Bur., Cleveland, Ohio
Wilson, W. (FC) Vancouver, B. C., Canada
Winfield, B. L. (FS) Jewish Orthodox Old Folks Home, St. Louis
Winfield, G. A. (FC) Dept. Vet. Affairs, Ottawa, Ont., Canada
Wing, H. (FC) Texas Confed. Home for Men, Austin
Winter, I. C. (FC) Glenview, Ill.
Witschi, E. (G) State U. Iowa, Iowa City
Woerner, C. A. (FB) U. Louisville Med., Louisville, Ky.
Wolcott, L. E. (M) Okemos, Mich.
Wolff, K. (M) Topeka State Hosp., Topeka, Kans.
Wolffe, Joseph B. (FC) Wolffe Clin. & Hosp., Philadelphia, Pa.
Wolffe, John R. (FC) Chicago, Ill.
Wolterink, L. F. (FB) Mich. State Coll., East Lansing
Wortman, B. (M) Washington U. Med., St. Louis, Mo.
Wright, E. D. (G) Community Welf. Counc., Salt Lake City, Utah

Yellott, (Mrs.) O. (FS) Beaumont, Texas
Yiengst, M. J. (FB) Baltimore City Hosps., Baltimore, Md.
Young, Olive E. (M) U. S. Employ. Serv., Washington, D. C.
Young, Phyllis K. H. (FS) London, England
Young, R. H. (G) Des Moines, Iowa
Yourglich, Anita (M) Seattle U., Seattle, Wash.

Zahler, H. (FC) Berlin, Germany
Zarrow, M. X. (FB) Purdue U., Lafayette, Ind.
Zelditch, M. (M) Conf. Jewish Fed. & Welf. Funds, N. Y. C.
Zell, (Mrs.) H. M. (FS) Gen. Fed. Women's Clubs, Wasco, Ore.
Zeller, F., Jr. (FC) Henry Ford Hosp., Detroit
Ziffren, S. E. (FC) U. Hosp., Iowa City, Iowa
Zinsser, H. H. (FC) U. S. Calif. Med., Los Angeles
Zollinger, Helen (G) Portland, Oregon
Zoref, F. V. (M) Fair Lawn, N. J.
Zorzoli, Anita (FB) Vassar Coll., Poughkeepsie, N. Y.
Zufall, B. (M) Forest Hills, N. Y.
Zweifach, B. W. (FB) N. Y. U., New York City

INDEX TO CURRENT PERIODICAL LITERATURE

NATHAN W. SHOCK
Gerontology Branch
National Heart Institute
National Institutes of Health

THE SUBJECT categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus, most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given (*B.A.—Biological Abstracts: P.A.—Psychological Abstracts*, and *P.I.—Population Index*). Abbreviations for journals are those used in *A World List of Scientific Periodicals Published in the year 1900-1933*, 2nd Edition. For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Branch, Baltimore City Hospitals, Baltimore 24, Maryland. The assistance of the Forest Park Foundation, Peoria, Illinois, in the preparation of these materials is gratefully acknowledged.

GERONTOLOGY

18179. Dorpat, T. E. (Chairman): *Proceedings of the Inland Empire Conference on Aging, Spokane, Washington, September 26-27, 1955.* Spokane, 1955, 27 pp. (Mimeogr.).

18180. Engle, E. T., and G. Pincus (Editors): *Hormones and the aging process.* Academic Press, Inc., New York, 1956, 323 pp.

18181. Fugiwara, S.: (Demand for physiology of the aged.) *Sogo Igaku, Tokyo, 7:* 287, 1950.

18182. Kotsovsky, D.: *Endogene Faktoren des Alterns.* Unger-Verlag, Berlin, 1956, 82 pp.

18183. Landabure, P. B. (President): La gerontologia e geriatria nei congressi. Buenos Aires, 17-19 November 1954. *Riv. Geront. Geriat., 5:* 233-240, 1956.

18184. Matuoka, Sy.: (Normal values of body functions in the aged.) *Gakujyutsu Geppo, Tokyo,* —: (22), 366, 1951.

18185. Rush, E.: Some biological factors in aging. *Ohio J. Sci., 55:* 193-199, 1955.

18186. Saheki, J.: (Old age.) *Kosei, Tokyo, 8:* 43, 1948.

18187. Steinberg, H. H.: The aging process in industrial employees. *Med. Clin. N. Amer.*, (Chicago No.), —: 21-32, 1956.

18188. Yamaura, A.: (Chemical determination of sex, blood relation, and ages.) *Jap. J. Genet., 24:* 112, 1949.

18189. Zorzoli, A.: The use of the mouse (*Mus musculus*) for aging studies. *Turtox News,* 33: 226-228, 1955.

BIOLOGY OF AGING

18190. Fukazawa, H.: (A family of longevity.) *Heredity, Tokyo, 5:* 442, 1951.

See also Nos. 18218, 18402.

I. CELLULAR BIOLOGY AND PHYSIOLOGY
(includes plants)

18191. Jones, H. B.: (The physiological age of the population of Sweden with respect to diseases and health.) (English and French summaries). *Soc. Medeel.*, —: (9), 497-505, 1955. *Abstr: P. I., 22:* No. 2328, 1956.

18192. Morikawa, T.: (Senile atrophy of tissues and cells.) *Nagoya Igaku, 66:* 431, 1952.

18193. Padawer, J., and A. S. Gordon: Peritoneal fluid mast cells; their numbers and morphology in rats of various body weights (ages). *J. Geront., 11:* 268-272, 1956.

See also Nos. 18182, 18404, 18406, 18407, 18457, 18516, 18821, 18824.

IV. LONGEVITY
(case reports, drugs, heredity, marriage, occupation, and sex differences)

18194. Arnould, E.: La durée de la vie n'a pas pour synonyme la longévité. *Pr. méd., 64:* 20, 1956.

18195. Cameron, C. A.: Longevity of flaxmill workers. *J. med. (chem.) Sci., 61:* 48-50, 1876.

18196. Cameron, C. A.: On the duration of human life under various conditions. *J. med. (chem.) Sci., 95:* 412-424, 1893.

18197. Cook, R. C.: Life grows longer. *Population Bull., 11:* 109-123, 1955. *Abstr: P. I., 22:* No. 2148, 1956.

18198. Cusack, J. W., and W. Stokes: On the mortality of medical practitioners in Ireland. *J. med. (chem.) Sci., 5:* 111-128, 1848.

18199. de Longeville, H.: *Histoire des personnes qui ont vecu plusieurs siecles, et qui ont rajeuni; avec le secret du rajeunissement, tiré d'Arnauld de Villeneuve.* Charpentier et Laurent le Comte, Paris, 1740, 343 pp.

18200. Hahimoto, K.: (External and internal environments of the long-lived.) *Prevent. Med., Tokyo, 1:* 59, 1950.

18201. Pierson, A. L.: Two cases of disease and dissection in old age. *N. Y. med. & phys. J., 2:* 67-74, 1829-1830.

18202. Samber, R.: *Long livers: a curious history of such persons of both sexes who have lived several ages, and grown young again, with the rare secret of rejuvenescency of Arnoldus de Villa Nova; and a great many approved and invaluable rules to prolong life; as also how to prepare the universal medicine, by Eugenius Philalethes.* J. Holland and L. Stokoe, London, 1722, lxiv, 199 pp.

18203. Shinoto, K., and Y. Yuasa: (Heredity of longevity—interim report.) *Jap. J. Genet., 24:* 88, 1949.

18204. Shurtleff, D.: Mortality among the married. *J. Amer. geriat. Soc., 4:* 654-666, 1956.

18205. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from selected causes by martial status; United States, 1949-1951. *Vit. Statist., Spec. Rep., 39:* (7), 303-429, 1956.

18206. Watanabe, J.: (Various problems of lifespan.) *Tokyo Ishikai Zasshi, 3:* 2, 1950.

IV-C. LONGEVITY: *Comparative Physiology*

18207. Chikagui, H.: (Studies on the rat flea. 6. Lifespan and toxicity of pest flea under various degrees of temperature environment.) *Med. & Biol., Tokyo, 14:* 287, 1949.

18208. Chikagui, H.: (Studies on the rat flea. 7. Lifespan toxicity of pest flea under various degrees of temperature environment.) *Med. & Biol., Tokyo, 14:* 287, 1949.

18209. Ingle, D. J.: Naturally occurring pathology in the aging rat. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 115-125.

18210. Mead, A. R.: Disease in the giant African snail (*Achatina fulica*) Bowdich. *Science, 123:* 1130-1131, 1956.

18211. Moore, N. W.: On the length of life of adult dragonflies (*Odonata—Anisoptera*) in the field. *Proc. Bristol nat. Soc., 28:* 267-272, 1951 (1952). *Abstr: B. A., 28:* No. 12359, 1954.

See also Nos. 18189, 18266, 18284.

IV-H. LONGEVITY: *Mortality Rates*

18212. Bolt, W., and E. A. Lew: Prognostic value of life insurance mortality investigations. *J. Amer. med. Ass., 160:* 736-741, 1956.

18213. Caffin, S. W.: Construction of mortality tables from population data. *Trans. actuar. Soc. Australia, 8:* 73-94, 1953. *Abstr: P. I., 22:* No. 2177, 1956.

18214. Caravaglios, F.: Considerazioni sulla distribuzione oraria della mortalità. *Riv. ital. igiene, 15:* 379-398, 1955.

18215. France. Institut National d'Hygiène: Incidence du sexe et de l'âge sur la morbidité et la mortalité par maladies infectieuses en 1953. *Bull. Inst. nat. Hyg., 9:* 831-849, 1954. *Abstr: P. I., 22:* No. 2194, 1956.

18216. Gitlitz, I.: Morbidity and mortality in old age. A study of experience in a modern home for the aged. Part I. *J. Amer. geriat. Soc., 4:* 543-559, 1956.

18217. Gitlitz, I.: Morbidity and mortality in old age. A study of experience in a modern home for the aged. Part II. *J. Amer. geriat. Soc., 4:* 708-721, 1956.

18218. Jones, H. B.: A special consideration of the aging process, disease, and life expectancy. *Adv. biol. med. Physics, 4:* 281-337, 1956. Also *in:* Radiation Lab., Univ. Calif., Berkeley, Nov. 1, 1955, UCRL-3105, pp. 1-68.

18219. Lancaster, H. O.: The mortality in Australia from syphilis. *Med. J. Aust., 42, 2:* 895-897, 1955.

18220. Lancaster, H. O.: The mortality in Australia from leuchaemia. *Med. J. Aust., 42, 2:* 1064-1065, 1955.

18221. Lilienfeld, A. M.: Variation in mortality from heart disease. *Publ. Hlth. Rep., Wash., 71:* 545-552, 1956.

18222. Metrop. Life Insur. Co.: Cancer in midlife. *Statist. Bull. Metrop. Life Insur. Co., 37:* 1-11, June, 1956.

18223. Moine, M., and C. Moine: Mortalité maternelle suivant l'âge et la cause du décès en divers pays. *Bull. Inst. nat. Hyg., 9:* 915-927, 1954. *Abstr: P. I., 22:* No. 2203, 1956.

18224. Stolnitz, G. J.: Mortality declines and age distribution. *Milbank mem. Fd. Quart. Bull., 34:* 178-215, 1956.

18225. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Tuberculosis, all forms. Death rates by age, race, and sex, United States; 1900-1953. *Vit. Statist., Spec. Rep., 43:* (2) 19-33, 1956.

18226. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Syphilis and its sequelae. Death rates by age, race, and sex, United States; 1900-1953. *Vit. Statist., Spec. Rep., 43:* (3), 35-49, 1956.

18227. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Typhoid fever. Death rates by age, race, and sex, United States; 1900-1953. *Vit. Statist., Spec. Rep., 43:* (4), 51-65, 1956.

18228. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Dysentery, all forms. Death rates by age, race, and sex, United States; 1900-1953. *Vit. Statist., Spec. Rep., 43:* (5), 67-80, 1956.

18229. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Diphtheria. Death rates by age, race, and sex, United States; 1900-1953. *Vit. Statist., Spec. Rep., 43:* (6), 83-96, 1956.

18230. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Whooping cough. Death rates by age, race, and sex: United States, 1900-1953. *Vit. Statist., Spec. Rep., 43:* (7), 99-112, 1956.

18231. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Meningococcal infections. Death rates by age, race, and sex; United States, 1900-1953. *Vit. Statist., Spec. Rep., 43:* (8), 115-128, 1956.

18232. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Acute poliomyelitis. Death rates by age, race, and sex; United States, 1900-1953. *Vit. Statist., Spec. Rep., 43:* (9), 131-144, 1956.

18233. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Measles. Death rates by age, race, and sex; United States, 1900-1953. *Vit. Statist., Spec. Rep., 43:* (10), 147-160, 1956.

18234. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Diabetes mellitus. Death rates by age, race, and sex; United States, 1900-1953. *Vit. Statist., Spec. Rep., 43:* (12), 187-200, 1956.

18235. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Abridged life tables; United States, 1954. *Vit. Statist., Spec. Rep., Nat. Summaries, 44:* (2), 34-44, 1956.

18236. Watanabe, S.: (An analysis of the marked decline in the rate of deaths due to diarrhea and enteritis, especially year to year changes at various ages.) *J. Jap. med., Ass., 26:* 63, 1951.

18237. Yeracaris, C. A.: Differential mortality, general and cause-specific in Buffalo; 1939-1941. *J. Amer. statist. Ass., 50:* 1235-1247, 1955. *Abstr: P. I., 22:* No. 2191, 1956.

18238. Zukel, W. J., H. E. Hilleboe, and J. T. Doyle: Cardiovascular disease programs for the community. *Publ. Hlth. Rep., Wash., 71:* 425-435, 1956.

See also Nos. 18191, 18205.

IV-I. Longevity: *National Groups*

18239. Amishima, Y.: (Statistical observations on the cases of contract of life insurance in the aged.) *Hoken Igaku Zasshi, Tokyo, 50:* 32, 1952.

18240. Arias, B. J.: Tablas de mortalidad para el Municipio de Guatemala 1921-1940-1950. *Rev. Col. méd. Guatemala, 4:* 315-334, 1953. *Abstr: P. I., 22:* No. 2176, 1956.

18241. Frauenfelder, W.: Beobachtungen über die Sterblichkeit bei den Einzel-Kapital-versicherung der Schweizerischen Lebensversicherungs- und Rentenanstalt. *Mitt. Verein. schweiz. Versich., 54:* 15-37, 1954. *Abstr: P. I., 22:* No. 2152, 1956.

18242. Hashimoto, K.: (Studies on the longevity from the view point of public health.) *Jap. J. Hyg., 3:* 42, 1949.

18243. Japan. Department of Public Health Statistics. Ministry of Health and Welfare: (Statistics of deaths in 1950. I. Death rate in various ages.) *Eisei Tokei, 5:* 16, 1952.

18244. Japan. Division of Health and Welfare Statistics. Welfare Minister's Secretariat: *The 9th life table.* (In Japanese with English summary.) The Division, Tokyo, 1955, x, 208 pp. *Abstr: P. I., 22:* No. 2182, 1956.

18245. Kodama, K.: (Factors controlling life span.) *Eiyo to Ryori, Tokyo, 14:* 2, 1948.

18246. León, A. P.: Análisis estadístico de las causas de mortalidad. Problemas principales de salud pública en México. *Bol. Soc. Geog. Estad., Mexico, 77:* 345-361, 1954. *Abstr: P. I., 22:* No. 2200, 1956.

18247. Paes Moraes, J. J.: Alguns aspectos da mortalidade em Portugal. (French summary). *Rev. Econ., 8:* 45-59, 1955. *Abstr: P. I., 22:* No. 2155, 1956.

18248. *Switzerland.* Eidgenössisches Statistisches Amt.: *(Swiss life tables, 1941/50 and 1948/53. Basic figures and net worth values.)* Berne, 1955, 86 pp. *Abstr: P. I., 22:* No. 2186, 1956.

18249. Tachi, M.: (World population problem and life-span.) *J. publ. Hlth., Tokyo, 8:* 58, 1950.

18250. Takayama, Y.: (Factors influencing the change in death rates in the aged and in the prime of life; an analysis of the data of 1920-1930.) *J. publ. Hlth., Tokyo, 9:* 36, 1951.

18251. Watanabe, S.: (Life span and diseases of the Japanese.) *J. publ. Hlth., Tokyo, 10:* 163, 1951.

18252. Yamazaki, M.: (The life span of the Japanese.) *Seikai Iho, Japan, 7:* 6, 1949.

18253. Yanagi, K., A. Nishihara, H. Yokota, and N. Matsuno: (Statistical and case studies on the survival rate of old age.) *Jap. J. Nutrit., 9:* 44, 1951.

V. Metabolism

18254. Albrecht, W.: Altersabhängigkeit der Gehirnphosphatasen bei der Maus. *Mschr. Kinderheilk., 103:* 412-414, 1955.

18255. Bottini, E.: L'intervento degli elementi minori nel ciclo vitale. *Minerva med., Torino, 46:* 1835-1836, 1955.

18256. Drill, V. A., and F. J. Saunders: Androgenic and anabolic action of testosterone derivatives. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 99-113.

18257. Fleisch, A.: *Le métabolisme basal standard et sa détermination au moyen du "Metabocalculator." Helv. med. acta, 18:* 23-44, 1951.

18258. Himwich, H. E., and W. A. Himwich: Brain metabolism in relation to aging. *J. chronic Dis., 3:* 487-498, 1956.

18259. Kuzuya, N., and M. Yakawa: (Metabolism of carbohydrate in the aged.) *Nihon Shokakybyo Gakai Zasshi, Tokyo, 49:* 55, 1952.

18260. Laszlo, D., and H. Spencer: Newer techniques in the study of calcium metabolism in man and effects of hormones thereon. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press., Inc., New York, 1956, pp. 175-200.

18261. Leathem, J. H.: Steroids and protein metabolism in experimental animals. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 79-97.

18262. Leverton, R. M., M. R. Gram, E. Brodovsky, M. Chaloupka, A. Mitchell, and N. Johnson: The quantitative amino acid requirements of young women. II. Valine. *J. Nutrit., 58:* 83-93, 1956.

18263. Leverton, R. M., M. R. Gram, M. Chaloupka, E. Brodovsky, and A. Mitchell: The quantitative amino acid requirements of young women. I. Threonine. *J. Nutrit., 58:* 59-81, 1956.

18264. Mueller, W. J., R. V. Boucher, and E. W. Callenbach: Influence of age and sex on the utilization of proximate nutrients and energy by chickens. *J. Nutrit., 58:* 37-50, 1956.

18265. Pearson, O. H.: The role of steroids in calcium and phosphorus metabolism. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 147-174.

18266. Rockstein, M.: Some biochemical aspects of aging in insects. *J. Geront., 11:* 282-285, 1956.

18267. Shibata, T.: (Statistical studies on the energy of basal metabolism in Japanese.) *Jap. J. Nutrit.,* 7: 69, 1949.

18268. Shock, N. W.: The effects of some of the steroid hormones on the metabolic balances in aged males. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 283-298.

18269. Szulc, G.: (The metabolism of the growth and aging period.) *Pamietnik VIII Lekarskiego Kursu Wakacyjnego w Ciechocinku, Warszawa,* —: 168-200, 1936.

18270. Weston, R. E.: Mechanisms regulating fluid and electrolyte metabolism, *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 201-220.

18271. White, A.: Effects of hormones on protein metabolism. *In*: E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 127-146.

18272. Yakawa, M.: (Studies upon the carbohydrate metabolism of the aged. II. Insulin sensitivity test and its results in the aged.) *Acta geront. jap.,* (22nd series), 46, 1951.

18273. Yakawa, M.: (Studies upon the carbohydrate metabolism of the aged. III. Changes of inorganic phosphorus in serum after administration of sugar.) *Acta geront. jap.,* (22nd series), 58, 1951.

18274. Yamanaka, K.: (On the metabolism of water and sodium chloride in the older individuals.) *Acta geront. jap.,* (22nd series), 81, 1951.
See also Nos. 18347, 18421, 18712.

VI. Nutrition

18275. Allen, I. B.: Food after 40. *Today's Hlth.,* 34: 32-35; 54, 56-59, June, 1956.

18276. Amako, F., T. Shimauchi, I. Nishikawa, and M. Seki: (Observations upon senile malnutrition.) *J. Jap. Soc. intern. med., 36:* 112, 1948.

18277. Arimoto, S.: (Studies on the relationship between food quality and longevity. (1) Food custom and longevity in wet rice field and dry farm districts of Niigata prefecture.) *Jap. J. Nutrit., 8:* 42, 1950.

18278. Barron J., and L. S. Fallis: Tube feeding with natural foods in elderly patients. *J. Amer. geriat. Soc., 4:* 400-404, 1956.

18279. Bottiglioni, E., and M. P. Carinci: Studio della diffusione cutanea da jaluronidasi e dei glicoprotidi serici in vecchi sottoposti a carico con vit. E. *Gior. Geront., 4:* 151-160, 1956.

18280. Cummins, W. J.: Case of remarkable tenacity of life in old age with observations on diet and stimulants. *J. med. (chem.) Sci., 32:* 217-222, 1861.

18281. Feniak, E.: Nutritional needs of the aged. *J. Canad. diet. Ass., 17:* 26-31, 1955.

18282. Glass, J.: *(Dietetics in aged people.)* Dietetyka, Warszawa, 1934, pp. 457-459.

18283. Kondo, Sh., M. Kato, and J. Abe: (Food customs, eating habits, and longevity.) *Jap. J. Hyg., 5:* 56, 1950.

18284. McCay, C. M., F. Pope, and W. Lunsford: Experimental prolongation of the life span. *Bull. N. Y. Acad. Med., 32:* 91-101, 1956.

18285. Martin, W. C.: Nutrition in preventive geriatrics. *J. Amer. geriat. Soc., 4:* 609-612, 1956.

18286. Millman, M.: Nutrition in the aged. *Today's Hlth., 34:* 24-25; 44, 46-47, May, 1956.

18287. Nakamura, Jr.: (Studies on the relationship between food quality and longevity. (2) Diet surveys.) *Jap. J. Nutrit., 8:* 43, 1950.

18288. Nakamura, J.: (Studies on the relationship between food quality and longevity. (3) Surveys on health conditions and longevity.) *Jap. J. Nutrit., 8:* 46, 1950.

18289. Pett, L. B.: Vitamin requirements of human beings. *Vitamin. Horm., N. Y., 13:* 213-237, 1955.

18290. Sara, R.: (Diseases of old age and dietetics.) *Shokuseikatsu, Tokyo, 514:* 70, 1952.

18291. Ujiie, K.: (Daily variations and the physiological conditions of amounts of vitamin B_1 in the urine of healthy individuals and the effects of high frequency waves at various ages.) *J. Jap. Soc. intern. med., 39:* 345, 1950.

18292. Williams, R. J.: Human nutrition and individual variability. *Borden's Rev. nutrit. Res., 17:* (2), 11-24, 1956.

See also Nos. 18262, 18263, 18320, 18447.

VII. Parental Age

18293. Takahaski, E.: (Sex ratio of the new-born and age of their mothers.) *Jap. J. publ. Hlth., 6:* 318, 1949.

IX. Rejuvenation

18294. Burstein, S. R.: The quest for rejuvenation. *Geriatrics, 10:* 536-540, 1955.

18295. Harada, A.: (Rejuvenation.) *Sogo Igaku, Tokyo, 7:* 337, 1950.

18296. Nakao, S.: Sexual rejuvenation and treatment of undeveloped reproductive organs.) *Kenko Dig., Tokyo, 5:* 58, 1952.

18297. Zurakowski, S.: (The present state of the reactivation problem, so called rejuvenescence of the organism.) *Ther. nova, Warszawa, —:* (10), 305-316, 1934. Also *in: Zag. Rasy, Warszawa, 8:* (1), 38-65, 1934.

X. Theories

18298. Harman, D.: Aging; a theory based on free radical and radiation chemistry. *J. Geront., 11:* 298-300, 1956.

18299. Nadel, M. B.: Old age's test—biological age and circulation. *Gior. Geront., 4:* 55-60, 1956.

18300. Still, J. W.: Are organismal aging and aging death necessarily the result of death of vital cells in the organism? A cybernetic theory of aging. *Med. Ann. District of Columbia, 25:* 199-204, 1956.

ORGAN SYSTEMS

I. Blood

18301. Boiron, M.: La durée de vie des plaquettes. *Sem. Hôp. Paris, 31:* 3688-3689, 1955.

18302. Bonessa, C., and A. Chiodaroli: La resistenza leucocitaria nel vecchio. *Gior. Geront., 4:* 161-164, 1956.

18303. Denny, G. H., Jr., and D. D. Hagerman: Cholinesterase activity of human leucocytes. *Science, 123:* 987-988, 1956.

18304. Isaacs, B. L.: Macrocytic anemias of older persons. *Med. Clin. N. Amer.*, (Chicago No.), —: 145-151, 1956.

18305. Izui, M.: (Studies of the physiological changes of blood platelets; effects of aging, sex, nutrition, menstruation, pregnancy and child-delivery.) *Acta haemat. jap. Kyoto, 12:* 176, 1949.

18306. Maccaferri, A.: Le anemie senili e loro comportamento nella terapia epatica e marziale. *Acta geront., 6:* 20-36, 1956.

18307. Maekawa, T., and T. Kumatori: (Changes of circulating white cells following adrenalin or typhoid vaccine injection and at the time of pneumonia.) *Acta geront. jap.*, (23rd series), 29, 1952.

18308. Ohara, T.: (Studies on the age difference of wandering velocity of leucocytes.) *Hokkaido Joshi-igaku Senmongakko Kiyo, 1:* 7, 1949.

I-A. Blood: *Chemistry*

18309. Czystohorski, T.: (Aging and associated biochemical changes.) *Polsk. Tygod. lek., 10:* 1553-1561, 1955.

18310. Ghinozzi, G. P.: Influenza dell'età e dell'attività di volo sulla colesterinemia di un gruppo di soggetti appartenenti all'Aeronautica Italiana. *Riv. med. Aero., Roma, 18:* 709-718, 1955.

18311. Havkins, W., E. Speck, and V. B. Leonard: Veränderungen des Hämoglobingehaltes nach Alter und Geschlecht. *Blood, 9:* 999, 1954.

18312. Hines, B. E., and R. A. McCance: Pseudo-cholinesterase activity in secretions and organs of piglets and pigs. *J. Physiol., 122:* 188-192, 1953. *Abstr: B. A. 28:* No. 20357, 1954.

18313. Ishii, T.: (On the glutathion in blood of the aged.) *Acta geront. jap., 47:* 5, 1950.

18314. Karel, J. L., V. M. Wilder, and M. Beber: Electrophoretic serum protein patterns in the aged. *J. Amer. geriat. Soc., 4:* 667-682, 1956.

18315. Kumagaya, H.: (Studies on the serum protein fraction of healthy Japanese at various ages and in both sexes by means of electrophoresis.) *Tokyo Jikeikai Ikadaigaku Zasshi, 66:* 154, 1952.

18316. Nöcker, J., and H. Bemm: Einwirkung von Alter und Geschlecht auf die Serumglobuline. II. Mitteilung. *Z. Altersforsch., 9:* 328-339, 1956.

18317. Page, I. H., L. A. Lewis, and J. Gilbert: Plasma lipids and proteins and their relationship to coronary disease among Navajo Indians. *Circulation, 13:* 675-679, 1956.

18318. Parhon, C. I., S. Oeriu, and I. Tănase: (Studies of the biology of various ages. I. The ratio of methionine to cysteinecystine as a test for determination of age in experimental studies.) *Bul. stiint. med., 7:* 883-889, 1955.

18319. Parhon, C. I., S. Oeriu, and I. Tănase: (Studies of the biology of various ages. II. The effect of cysteine and methionine on the metabolism of thio-amino-acids in the blood of aged rats.) *Bul. stiint. med., 7:* 891-899, 1955.

18320. Roen, P. B.: Reduction of serum lipids by dietary management; report on 50 cases. *Geriatrics, 11:* 200-202, 1956.

18321. Samuels, L. T.: Effect of aging on the steroid metabolism as reflected in plasma levels. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 21-38.

18322. Seki, M.: (On the amounts of serum indican in the old age.) *Acta geront. jap.*, (19th series), 205, 1949.

18323. Shephard, R. J.: The influence of age on the haemoglobin level in congenital heart disease. *Brit. Heart J., 18:* 49-54, 1956.

18324. Shipley, R. E.: Symposium on sitosterol. I. The effects of sitosterol ingestion on serum cholesterol concentration. *Trans. N. Y. Acad. Sci., 18:* 111-118, 1955.

18325. Truscott, B. L., and G. Van Wagenen: Serum vitamin A in normal and A-deficient monkeys (*Macaca-mulatta*). *Yale J. Biol. Med., 25:* 139-146, 1952. *Abstr: B. A. 28:* No. 516, 1954.

18326. van Zyl, A.: Protein-bound iodine in the serum of the baboon (*Papio ursinius*). *S. Afr. J. med. Sci., 20:* 9-22, 1955.

18327. Von Plotho, B.: Untersuchungen über den Cholesterinspiegel im Serum bei akuten und chronischen Arthritiden. *Klin. Med., Wien, 10:* 452-454, 1955.

18328. Yakawa, M.: (Studies upon the carbohydrate metabolism of the aged. I. Anabolism of carbohydrates and mechanism of hemostatic maintenance of blood sugar.) *Acta geront. jap.*, 22nd series), 33, 1951.

See also No. 18890.

II. Blood Forming & Destroying Organs

18329. Hukui, M.: (Bone marrow of old persons.) *Tokyo Ikadaigaku Zasshi, 9:* 3, 1951.

18330. Torii, Sh., and K. Ota: (Contributions to the knowledge of the picture of the bone marrow of the aged healthy.) *Acta haemat. jap., 15:* 186, 1952.

III. Cardiovascular System

(blood vessels, blood pressure, hypertension, blood volume, veins, and arteriosclerosis)

18331. Bassani, A., and S. Fantini: Effetti della somministrazione di 5-idrossitriptamina nei vecchi con positività delle prove del laccio. *Gior. Geront., 4:* 131-138, 1956.

18332. Brown, C. E., T. C. Huang, E. L. Bortz, and C. M. McCay: Observations on blood vessels and exercise. *J. Geront., 11:* 292-297, 1956.

18333. Carmichael, R.: Gangrena senilis. *J. med. (chem.) Sci., 2:* 233-234, 1846.

18334. Casassa, P. M., and A. Alliod: L'oscillografia differenziale ai quattro arti nei soggetti anziani. *Acta geront., 6:* 44-62, 1956.

18335. Creech, O., Jr., E. S. Crawford, D. A. Cooley, and M. E. Debakey: By-pass procedure in treatment of arteriosclerotic occlusion of iliac and femoral arteries. *Geriatrics, 11:* 284-288, 1956.

18336. Eiseman, P. C., Jr., and L. F. Bush: Lumbar sympathectomy in the arteriosclerotic lower limb. *Geriatrics, 11:* 299-305, 1956.

18337. Gage, M.: Management of varicose veins. *Geriatrics, 11:* 212-216, 1956.

18338. Goldbloom, A. A., H. B. Eiber, L. J. Boyd, I. Chapman, O. Deutschberger, and W. R. Loewe: Recent methods in the study and treatment of atherosclerosis in normal subjects 80-100 years of age. *Arch. intern. Med., 97:* 359-377, 1956.

18339. Graham, J. G., and R. D. H. Maxwell: Hypertension. *J. Amer. geriat. Soc., 3:* 448-462, 1956.

18340. Herbeuval, R., and G. Cuny: L'hypertension chez les gens agés. *Ann. Méd., 57:* 40-109, 1956.

18341. Hevelke, G.: The function and structure of the arteries as related to age; an angio-chemical study. *Angiology, 7:* 39-54, 1956.

18342. Hibi, S.: (Figures of the blood pressure of Japanese in recent years.) *Sogo Igaku, Tokyo, 5:* 238, 1948.

18343. Horáček, J.: (Directions on prevention of varicose veins in workers.) *Ceskoslov. Derm., 30:* 226-229, 1955.

18344. Horike, M., and M. Kuwahara: (Circulation time in the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 15:* 7. 1951.

18345. Ikeda, M.: (Distributions of arteriolar sclerosis in the aged, and their relationship to hypertension.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 16:* 245, 1952. Also *in: Acta geront. jap.*, (23rd series), 17, 1952.

18346. Kanai, K.: (Statistical studies on the blood pressure of the Japanese.) *Hoken Igaku Zasshi, Tokyo, 50:* 31, 1952.

18347. Kirk, J. E., and M. Dyrbye: Hexosamine and acid-hydrolyzable sulfate concentrations of the aorta and pulmonary artery in individuals of various ages. *J. Geront., 11:* 273-281, 1956.

18348. Kluczny, J.: (Aging of the circulatory system.) *Probl. lek., Warszawa, 1:* (4), 469-478, 1954.

18349. Kyser, F. A.: The management of hypertension in elderly adults. *Med. Clin. N. Amer.*, (Chicago No.), —: 195-202, 1956.

18350. Lax, H., A. W. Feinberg, and B. M. Cohen: Studies of the arterial pulse wave. I. The normal pulse wave and its modification in the presence of human arteriosclerosis. *J. chronic Dis., 3:* 618-631, 1956.

18351. Lowenberg, E. L.: Diseases of the peripheral veins in the aged. *Geriatrics, 11:* 275-283, 1956.

18352. May, R.: Schäden und Gefahren bei der Varizenbehandlung. *Münch. med. Wschr., 98:* 13-16, 1956.

18353. Mirabeau, M.: Algumas considerações sôbre varizes. *Arq. brasil. Med. nav., 16:* 3879-3888, 1955.

18354. Miyao, S., Y. Hirato, H. Tokuomi, T. Matsui, and T. Suzuki: (Studies on hypertension. 2. Statistical survey on hypertension and age distribution of hypertensive cases.) *Kumamoto Igakai Zasshi, 23:* 98, 1949.

18355. Moretz, W. H.: Management of lower extremities with chrónic arterial insufficiency. *Geriatrics, 11:* 289-298, 1956.

18356. Murakami, M.: (Velocity of pulse waves in the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 15:* 82, 1952.

18357. Murakami, M., I. Nishikawa, M. Seki, M. Ikeda, K. Hirosawa, H. Araya, and M. Kurihara: (Studies on the circulatory organs of the aged. III. Carotid sinus reflex in the aged. 2. Cerebral reflex.) *Acta geront. jap.*, (20th series), 13, 1950.

18358. Murakami, M., I. Nishikawa, M. Seki, M. Ikeda, K. Hirosawa, H. Araya, and M. Kurihara: (Studies on the circulatory organs of the aged. III. Carotid sinus reflex in the aged. 3. Considerations on autopsy findings.) *Acta geront. jap.*, (20th series), 18, 1950.

18359. Murakami, M., I. Nishikawa, M. Seki, M. Ikeda, K. Hirosawa, M. Kuwahara, and H. Araya: (Carotid sinus reflex of the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 12:* 66, 1948.

18360. Murakami, M., I. Nishikawa, M. Seki, M. Ikeda, M. Kuwahara, H. Araya, and K. Hirosawa: (Studies on the circulatory organs of the aged. III. Carotid sinus reflex in the aged. I. Depressor reflex and heart inhibition reflex.) *Acta geront. jap.*, (20th series), 1, 1950.

18361. Murakami, M., I. Nishikawa, M. Seki, K. Shiga, M. Ikeda, K. Hirosawa, H. Araya, and M. Kishimoto: (Statistical surveys on the coronary arteriosclerosis valvesclerosis, and hypertrophy of the cardiac muscle in the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 13:* 87, 1949.

18362. Nakazima, M.: (Clinical studies on the human capillaries. VI. Effects of heat stimuli upon capillaries of patients of essential hypertension —in the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 14:* 249, 1951.

18363. Nishikawa, I.: (Studies on the circulatory organs of the aged. I. Observations on the sclerotic change of aorta, especially in its elasticity.) *Acta geront. jap.*, (19th series), 1, 1949.

18364. O'Ferrall, J. M.: Senile gangrene. *J. med. (chem.) Sci., 10:* 477-480, 1853.

18365. Rechenberger, J., and G. Hevelke: Der Magnesiumgehalt der Aorta beim Diabetiker und seine Abhängigkeit vom Lebensalter. *Z. Altersforsch., 9:* 309-315, 1956.

18366. Sato, K.: (Fundamental studies on the physique and constitution. I. Blood pressure.) *Bull. res. Inst. diathetic Med., Japan, 15:* 121, 1949.

18367. Seki, M.: (Studies on the blood pressure in the aged. I. A statistical survey.) *Acta geront. jap.*, (19th series), 47, 1949.

18368. Seki, M.: (Studies on the blood pressure in the aged. II. Daily and hourly variations of the blood pressure in the aged.) *Acta geront. jap.*, (19th series), 70, 1949.

18369. Seki, M.: (Studies on the blood pressure in the aged. III. Blood pressure regulation in the aged.) *Acta geront. jap.*, (19th series), 85, 1949.

18370. Sordi, A., M. Rosselli, F. M. Antonini, and S. Viola: Sul significato dei tests umorali nella diagnostica dell'ateriosclerosi; osservazioni da una casistica di 94 soggetti precordiaglici. *Gior. Geront., 4:* 218-226, 1956.

18371. Tamura, A.: (Aging and changes of isoelectric point of arterial wall and its structural density.) *Kaibogaku Zasshi, Tokyo, 23:* 12, 1948.

18372. Tanaka, Sh.: (Peripheral vessels of the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 13:* 90, 1949.

18373. Yoshimura, H., and T. Iida: Studies on the reactivity of skin vessels to extreme cold. II. Factors governing the individual difference of th reactivity, or the resistance against frost-bite. *Jap. J. Physiol., 2:* 177-185, 1952. *Abstr: B. A., 28:* No. 8618, 1954.

See also Nos. 18299, 18395.

III-G. CARDIOVASCULAR SYSTEM: *Heart*
(heart, anatomy and physiology, heart disease, coronary artery disease, and myocardial disease)

18374. Beck, C. S.: The old and the new in coronary artery disease. *J. Amer. geriat. Soc., 4:* 315-327, 1956.

18375. Coogan, T. J., J. A. Davis, and R. N. Hedges, Jr.: Coronary artery disease in the aged. *Med. Clin. N. Amer.*, (Chicago No.), —: 177-184, 1956.

18376. De Bettencourt, J. M., and H. P. Monteiro: Le traitement de l'angine de poitrine par le visnagne; étude clinique. *Med. contemp., 73:* 521-532, 1955.

18377. Dock, W.: Aging of the myocardium. *Bull. N. Y. Acad. Med., 32:* 175-179, 1956.

18378. Donomae, I., and Y. Matsumoto: (Heart disease in the old age.) *Nihon Rinsho, Osaka, 10:* 222, 1952.

18379. Engelberg, H.: The prophylactic management of coronary atherosclerosis. *Geriatrics, 11:* 243-248, 1956.

18380. Fitz, F. W., and J. R. Laadt: Disturbances of the cardiac mechanism and the aging heart; arrhythmias and conduction defects and their treatment. *Med. Clin. N. Amer.*, (Chicago No.), —: 153-175, 1956.

18381. Fukutome, Y.: (Studies on the type of heart beat with x-ray kymogram. II. Changes with the ages and sex.) *J. Radiol. phys. Ther., 11:* 53, 1950.

18382. Harris, R.: Cardiovascular rehabilitation of geriatric patients. *N. Y. St. J. Med., 55:* 2037-2040, 1955.

18383. Heller, B. I.: Congestive heart failure in senescence. *Med. Clin. N. Amer.*, (Chicago No.), —: 185-194, 1956.

18384. Hochrein, M.: Zur Beurteilung der Einsatzfähigkeit von Angina-pectoris-Kranken. *Münch. med. Wschr., 97:* 1618-1622, 1955.

18385. Iijima, Y.: (Age changes of the auricle, especially its elastic fibres.) *J. otorhinolaryng. Soc. Japan, 54:* 104, 1951.

18386. Iijima, Y.: (Age changes of the auricle. II. Elasticity of the auricle.) *J. otorhinolaryng. Soc. Japan, 55:* 231, 1952.

18387. Kato, Sh., and A. Masukawa: (Age changes of various biometrical data of the auricle.) *Kaibogaku Zasshi, Tokyo, 27:* 8, 1952.

18388. Matsumoto, H.: (Studies on the circulatory organs of the aged. (4) Supplementary studies of electrocardiograms of the aged, cases of positive Wassermann's reaction, and of diabetes.) *Jap. J. intern. Med., 38:* 191, 1949.

18389. Milles, G., and W. D'Alessandro: The heart weight and coronary artery circumference relationship in myocardial infarction and myocardial failure. *Proc. Inst. Med. Chicago, 19:* 326, 1953. *Abstr: B. A., 28:* No. 3186, 1954.

18390. Murakami, M., and H. Matsumoto: (Influence of diabetes upon electrocardiograms of the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 11:* 111, 1947.

18391. Murakami, M., I. Nishikawa, M. Seki, M. Kuwahara, K. Hirosawa, H. Araya, and N. Suwa: (Comparative studies of pathological anatomical pictures with electrocardiography of the aged.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 12:* 100, 1948.

18392. Murakami, M., I. Nishikawa, M. Seki, K. Shiga, H. Araya, and M. Kishimoto: (Statistical surveys on the post-mortem findings of circulatory organs in the aged.) *J. Jap. Soc. intern. med., 38:* 134, 1949.

18393. Nishikawa, I.: (Studies on the circulatory organs of the aged. II. Studies on the heart sounds in the aged.) *Acta geront. jap.,* (19th series), 11, 1949.

18394. Nishikawa, I.: (Studies on the heart sounds of the aged. (2) Influence of senile changes neighboring aortic valve opening upon first aortic sounds.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 13:* 122, 1949.

18395. Ogura, M.: (Studies on the x-ray kymography of the heart and thoracic aorta in patients of high blood pressure. (1) Data of measurements of normal persons, and their correlation with age, maximum blood pressure, pulse pressure, and height of aorta.) *J. Radiol. phys. Ther., 7:* 75, 1948.

18396. Seki, M.: (Studies on the circulatory organs in the aged. V. (3). Electrocardiograms and dilatation of the heart.) *Acta geront. jap.,* (20th series), 25, 1950.

18397. Seki, M.: (Studies on the circulatory organs in the aged. V. (1). Comparison of macroscopic finding at the heart muscle with electrocardiograms.) *Acta geront. jap.,* (20th series), 57, 1950.

18398. Seki, M.: (Studies on the circulatory organs in the aged. V. (2). Comparison of pathological-histological findings of the heart muscle with electrocardiograms.) *Acta geront. jap.,* (20th series), 68, 1950.

18399. Simonson, E., and A. Keys: The effect of age on mean spatial QRS and T vectors. *Circulation, 14:* 100-104, 1956.

18400. Sluzar, W. J.: (Heart hormone in the course of treatment of angina pectoris and heart muscle diseases in aged people.) *Med. Prakt., Poznań, 11:* (15-16), 330-337, 1937.

18401. Suzue, K.: (Changes of heart and blood vessels in the aged, especially heart of old persons and arteriosclerosis.) *Nihon Rinsho, Osaka, 10:* 215, 1952.

18402. Yamada, K.: (Studies on the amount of potassium and water contents in the heart muscle of old individuals.) *Acta geront. jap.,* (23rd series), I, 1952.

See also Nos. 18808, 18882.

IV. Connective Tissue and Cartilage

18403. Banga, I., J. Baló, and D. Szabó: Metacollagen as the apparent elastin. *J. Geront., 11:* 242-250, 1956.

18404. Bourne, G. H.: Connective tissue and its changes with age. *Nature, Lond., 177:* 467-468, 1956.

18405. Fukai, S.: (Changes of connective part of ribs with costal cartilage due to aging, and their application to age judgement.) *Jap. J. legal Med., 2:* 181, 1948.

18406. Laursen, T. J. S., R. S. Laursen, and J. E. Kirk: Diffusion coefficient of urate for human connective tissue membrane. *Proc. Soc. exp. Biol., N. Y., 92:* 364-365, 1956.

18407. Sommers, S. C.: Basement membranes, ground substance, and lymphocytic aggregates in aging organs. *J. Geront., 11:* 251-260, 1956.

V. Endocrine System

(includes sex glands and climacteric)

18408. Albert, A., R. V. Randall, R. A. Smith, and C. E. Johnson: Urinary excretion of gonadotropin as a function of age. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 49-62.

18409. Andosca, J. B.: Clinical effect of combined mephenesin and glutamic acid hydrochloride in the menopausal and postmenopausal patient. *Amer. Practit., 7:* 223-226, 1956.

18410. Balassi, G. P.: Considerazioni sulle possibilità d'impiego delle jodoproteine artificiali tireoattive in fase climaterico-menopausica e nella terapia geriatrica ginecologica. *Minerva gin., Torino, 7:* 683-689, 1955.

18411. Cope, T. I.: Some aspects of postmenopausal bleeding. *Obstet. Gynec., 7:* 153-160, 1956.

18412. Cottafavi, M.: Ricerche sull'azione dell'eparina sulla lipemia alimentare nella donna in menopausa inoltrata. *Minerva gin., Torino, 7:* 826-832, 1955.

18413. Erlande, G.: Les troubles cardio-vasculaires de la ménopause et leur traitement. *Progr. méd., Paris, 83:* 334-342, 1955.

18414. Fernández-Ruiz, C.: Reacción decidual del endometrio desencadenada por estrógenos, en menopáusica. *Rev. esp. Obstet. Ginec., 14:* 336-338, 1955.

18415. Hamilton, J. B.: Androgenic activity per milligram of colorimetrically measured ketosteroids in urine; an index of the respective contributions from testicular and extra-testicular sources. *J. clin. Endocrinol. & Metab., 14:* 452-471, 1954. *Abstr: B. A., 28:* No. 28603, 1954.

18416. Hurwitz, D.: Management of foot lesions in the elderly diabetic. *J. Amer. geriat. Soc., 4:* 648-653, 1956.

18417. Katzman, B.: Low-dosage androgen-estrogen therapy for relief of the menopausal syndrome and hypoestrinism. *Amer. J. Obstet. Gynec., 71:* 421-425, 1956.

18418. Korenchevsky, V.: Treatment of senescent male rats with cortisone acetate alone or together with sex and thyroid hormones. *J. Geront., 11:* 261-267, 1956.

18419. McEnery, W. B., and W. O. Nelson: Organic phosphorus compounds in the testis of the rat at various ages. *Endocrinology, 52:* 93-103, 1953. *Abstr: B. A., 28:* No. 844, 1954.

18420. MacFarlane, D. A., C. B. Leman, P. L. Munson, and J. H. Harrison: The effect of ACTH administration on the urinary excretion of androgens and other steroids by old men in comparison with young men; preliminary report. *J. Urol., 75:* 558-561, 1956.

18421. McGavack, T. H., and W. Seegers: Thyroid function and disease in old age. *J. Amer. geriat. Soc., 4:* 535-542, 1956.

18422. Masters, W. H.: Sex steroid replacement in the aging individual. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 241-251.

18423. Mori, Sh., T. Hayashi, Sh. Nagashima, Y. Nonouchi, and J. Shutoku: (A statistical observation of the tumor of endocrine glands; age distribution.) *Gann, Tokyo, 41:* 152, 1950.

18424. Mortensen, J. D., L. B. Woolner, and W. A. Bennett: Gross and microscopic findings in clinically normal thyroid glands. *J. clin. Endocrinol. & Metab., 15:* 1270-1280, 1955.

18425. Mruk, J.; *(Suprarenal gland alternations in aged people.) Polska Akademia Umiejetności, Kraków,* 1946, 26 pp.

18426. Norymberski, J. K., R. D. Stubbs, and H. F. West: Assessment of adrenocortical activity by assay of 17-ketogenic steroids in urine. *Lancet, 1:* 1276-1281, 1953. *Abstr: B. A., 28:* No. 817, 1954.

18427. O'Connor, —.: On climacteric change. *J. med. (chem.) Sci., 60:* 78-80, 1875.

18428. Pincus, G.: Aging and urinary steroid excretion. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 1-20.

18429. Planel, H., and A. Guilhem; Contribution à l'étude histochimique des pigments de la glande surrénale du cobaye en fonction de l'âge. *C. R. Soc. Biol., Paris, 149:* 1504-1506, 1955.

18430. Rawson, R. W.: The thyroid in the aging process. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 39-47.

18431. Ruiz, V., and C. R. Uribe: Tumores del aparato genital en el climaterio. *Sem. méd., B. Aires, 108:* 5-11, 1956.

18432. Sato, B.: (Weight of endocrine glands in Japanese — age distribution.) *Tokyo Ikadaigaku Zasshi, 8:* 221, 1950.

18433. Seki, M.: (The excretion of 17-ketosteroids in urine of the aged.) *Acta geront. jap.,* (23rd series), 186, 1952.

18434. Shelton, E. K.: The pros and cons of estrogen administration after the menopause. *J. Amer. geriat. Soc., 4:* 348-357, 1956.

18435. Wagner, H.: *Das Klimakterium der Frau; eine Studie zur Pathogenese und Therapie der klimakterischen Beschwerden.* Ferdinand Enke Verlag, Stuttgart, 1955, 113 pp.

See also Nos. 18234, 18256, 18261, 18265, 18268, 18271, 18727, 18321, 18474, 18478, 18729, 18764, 18840, 18895.

VI. Gastro-Intestinal Tract

18436. Bjork, A.: Variability and age changes in overjet and overbite. *Amer. J. Orthodont.,* 39: 779-801, 1953. *Abstr: B. A., 28:* No. 13594, 1954.

18437. Borkowski, I.: (Acute appendicitis in aged people.) *War. Czas. lek., Warszawa, 13:* 273-276, 1936.

18438. De Juan Martín, M.: Consideraciones sobre la cirugía de la apendicitis aguda en el viejo. *Rev. esp. Enferm. Ap. digest, 14:* 631-646, 1955.

18439. Desjacques, R., and M. Chovet: L'ulcère hémorragique de l'estomac chez le vieillard. *Lyon chir., 50:* 727-729, 1955.

18440. De Vecchis, C. E.: La disorganizzazione dei rapporti occlusali nel quadro della patologia dentale senile. *Riv. Geront. Geriat., 5:* 225-232, 1956.

18441. Fraenkel, G. J., and S. C. Truelove: Haematemesis in the elderly. *J. Amer. geriat. Soc., 4:* 415-428, 1956.

18442. Ito, Ry.: (Acute appendicitis in the aged.) *Sogo Igaku, Tokyo, 6:* 1185, 1949.

18443. Kai, T., and T. Nakaoka: (Appendicitis in the aged.) *Surgery, Tokyo, 13:* 136, 1948.

18444. Kamijo, K.: (Anatomical studies of hard palate of Japanese in Kyusyu-District—aging change.) *Kaibogaku Zasshi, Tokyo, 25:* 215, 1950.

18445. Kawamata, Y.: (Relationship between the location of gastro-duodenal ulcers and age as well as symptoms.) *Surgery, Tokyo, 12:* 416, 1950.

18446. Kishii, M., H. Hasegawa, and I. Hayashi: (Liver functions of the aged.) *Nagoya Igaku, 66:* 100, 1952.

18447. Kishikawa, M., H. Hasigawa, and I. Hayashi: (Protective effects of methionine against disorders of liver function in the old individual.) *J. Jap. Soc. intern. med., 41:* 44, 1952.

18448. Koga, H., and T. Matsuoka: (Clinical specificity of gastric (duodenal) ulcers of the aged.) *Nihon Geka Gakai Zasshi, Tokyo, 47:* 22, 1948.

18449. Kondo, D., and S. Omura: (Digestive diseases in the old age.) *Nihon Rinsho, Osaka, 10:* 404, 1952.

18450. Mahlo, A.: Die röntgenologische Untersuchung des Magens beim alten Menschen. *Dtsch. Z. Verdauungskr., 15:* 129-137, 1955.

18451. Marshall, E. A., and M. Sass: Treatment of peptic ulcer in the aged with unrestricted diet. *J. Amer. geriat. Soc., 3:* 498-504, 1956.

18452. Martin, J. D., Jr.: Acute appendicitis in the elderly patient. *Geriatrics, 11:* 227-228, 1956.

18453. Masaki, M.: (Dentistry of the aged.) *Nihon Shika Hyoron, Tokyo,* 95: 6, 1950.

18454. Metrop. Life Insur. Co.: Periodontal disease in adults. *Statist. Bull. Metrop. Life Insur. Co.,* 37: 8-10, April, 1956.

18455. Mishima, K., and Y. Kawabe: (A case of tongue tuberculosis in the aged.) *J. otorhinolaryng. Soc. Japan, 54:* 212, 1951.

18456. Morikawa, T.: (Senile changes of the liver.) *Juzen Igakukai Zasshi, 51:* 153, 1949.

18457. Morikawa, T.: Senile atrophy and malnutritional atrophy of the liver.) *Nagoya Ichiritsu Daigaku Igaku Zasshi, 3:* 216, 1953.

18458. Moritsch, P.: Die Stuhlverhaltung im höheren Lebensalter und ihre Ursache. *Wien. med. Wschr., 104:* 970, 1954.

18459. Nomura, Sh.: (Gastric ulcers of the aged.) *Modern Therapy, Tokyo, 3:* 10, 1949.

18460. Okamoto, K., and M. Kuwahara: (Studies on the liver function of the aged.) *Nihon Shokakybyo Gakai Zasshi, Tokyo, 49:* 38, 1951.

18461. Rafalowski, I.: (Acute appendicitis in aged people and the practitioner.) *Prak. lek., Kraków, 7:* 133-136, 1938.

18462. Shimizu, Sh.: (Pathological studies on the appendix and appendicitis in the aged.) *Nihon Geka Gakai Zasshi, Tokyo,* (49th series), 264, 1949.

18463. Shimizu, Sh.: (Pathological studies on the appendix and appendicitis of old age.) *Nihon Geka Gakai Zasshi, Tokyo,* (50th series), 277, 1949.

18464. Sklar, M., J. B. Kirsner, and W. L. Palmer: Gastrointestinal disease in the aged. *Med. Clin. N. Amer.,* (Chicago No.), —: 223-237, 1956.

18465. Tauchi, H.: (The senile atrophy of liver and senescence of hepatic cells.) *Nagoya Igaku, 66:* 243, 1952.

18466. Vesfamil'Naia, Z. I.: (Appendicitis in aged.) *Sovetsk. Med., 19:* 63-68, 1955.

18467. Watanabe, K.: (The function of digestive organs in old age.) *Nagoya Igaku, 66:* 433, 1952.

18468. Wertheim, A., and I. Borkowski: (The acute total intestinal obstruction as the first symptom of the acute appendicitis in aged people.) *Polski przegl. chir., 14:* (4-5) 589, 1935.

18469. Yagi, Y.: (Appendicitis in the aged.) *Yuwate Igakai Zasshi, Morioka, 1:* 144, 1948.

18470. Yamanaka, K.: (Test for absorption time of papule by saline in the aged.) *Acta geront. jap.,* (19th series), 125, 1949.

18471. Yao, S.: (Teeth and longevity.) *Nihon Shika Hyoron, Tokyo,* —: (120), 40, 1952.

18472. Yoshida, T.: (The bacterial flora at various parts of intestine in the aged I.) *Acta geront. jap.,* (23rd series), 45, 1952.

18473. Yoshida, T.: (The bacterial flora of feces in the aged II.) *Acta geront. jap.,* (24th series), 131, 1953.

VII. Kidney

18474. Friedman, S. M., J. A. M. Hinke, and C. L. Friedman: Neurohypophyseal responsiveness in the normal and senescent rat. *J. Geront., 11:* 286-291, 1956.

18475. Kano, M.: (Renal tuberculosis in the aged.) *Hirosaki Igaku, Hirosaki, 1:* 72, 1950.

18476. Sasa, R.: (Renal diseases in the old age.) *Nihon Rinsho, Osaka, 10:* 228, 1952.

18477. Trabucco, A., and F. J. Márquez: Envejecimiento del riñón. *Rev. argent. Urol., 24:* 313-328, 1955.

IX. Muscular System

18478. Kochakian, C. D., and C. Tillotson: Hormonal regulation of muscle development. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 63-78.

See also No. 18607.

X. Nervous System (neurology)

18479. Abe, Sh., and Ry. Yamada: Investigations on aging factors in the clinical experiences of encephalitis Japonica.) *Jap. med. J.,* —: (1328), 2044, 1948.

18480. Amako, F., Z. Takahashi, Y. Toyokura, H. Nakamura, T. Tsubaki, Y. Kuroyuwa, Y. Inada, and M. Miyahara: (Amount of lipids in the nervous system and nuclear changes in the Wallerian degeneration in old persons.) *J. Jap. biochem. Soc., 23:* 191, 1951.

18481. Andrew, W.: Structural alterations with aging in the nervous system. *J. chronic Dis., 3:* 575-596, 1956.

18482. Charcot, —.: Du tremblement sénile. *Progr. méd., Paris,* —: 815, 1876.

18483. Cooper, I. S.: *The neurosurgical alleviation of Parkinsonism.* Charles C. Thomas, Springfield, Ill., 1956, 120 pp.

18484. Critchley, Mac.D.: Neurologic changes in the aged. *J. chronic Dis.,* 3: 459-477, 1956.

18485. Cuming, J.: Recent researches on cerebral haemorrhage. *J. med., (chem.) Sci., 48:* 580-586, 1869.

18486. Démange, E.: Tremblement sénile et ses rapports avec la paralysie agitante. *Rev. méd., Paris, 2:* 58, 1882.

18487. Divry, F.: Étude histochémique des plaques séniles. *J. Neurol. Psychopath., 27:* 643, 1927.

18488. Gordan, G. S., and J. E. Adams: Cerebral metabolism in the aging process; the steroid factor. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 299-309.

18489. Himwich, H. E., and F. Rinaldi: An analysis of the activating system including its use for screening anti-Parkinson drugs. *Yale J. Biol. Med., 28:* 308-319, 1956.

18490. Kelley, B.: Age and nitrogen content of rabbit brain parts. *Amer. J. Physiol., 185:* 299-301, 1956.

18491. Kelly, A. O. J.: Senile paraplegia. *J. nerv. ment. Dis., 23:* 717, 1896.

18492. Kennedy, C., L. Sokoloff, and W. Anderson: Cerebral blood flow and metabolism in normal children. *Amer. J. Dis. Child., 88:* 813, 1954.

18493. Kety, S. S.: Human cerebral blood flow and oxygen consumption as related to aging. *J. chronic. Dis., 3:* 478-486, 1956.

18494. Kety, S. S., and C. F. Schmidt: Effects of altered arterial tensions of carbon dioxide and oxygen on cerebral blood flow and cerebral oxygen consumption of normal young men. *J. clin. Invest., 27:* 484, 1948.

18495. Kitaoka, M., K. Okubo, and T. Miura: (Statistical survey on the epidemics of horse encephalitis in 1947 among the aged.) *Tokyo Iji Shinshi, 14:* 287, 1949.

18496. Kuroyuwa, Y.: (Clinical pathological studies on the nervous diseases of the aged. (1) A clinical statistical survey.) *Nou to Shinkei, Tokyo, 4:* 263, 1949.

18497. Lugaresi, F.: Sul probabile significato di alcuni aspetti eeg presenti in malattie degenerative del sistema nervoso. *Riv. Neurol., 25:* 659-663, 1955.

18498. McDonald, G. O., and G. De Takats: Use of the cervical sympathetic block in the early treatment of apoplexy. *Geriatrics, 11:* 249-252, 1956.

18499. Marshall, J.: Spastic paraplegia of middle age; a clinicopathological study. *Lancet, 1:* 643, 1955.

18500. Mitchell, C. J.: Nervous affections of the sixth and seventh decades of life. *Lancet, 2:* 1016, 1915.

18501. Millikan, C. H., J. S. Lundy, and L. A. Smith: Evaluation of stellate ganglion block for acute focal cerebral infarcts. *J. Amer. med. Ass., 151:* 438, 1953.

18502. Millikan, C. H., and F. P. Moersch: Factors that influence prognosis in acute focal cerebrovascular lesions. *Arch. Neurol. Psychiat., Chicago, 70:* 558-562, 1953. *Abstr: B. A., 28:* No. 20578, 1954.

18503. Misao, T., et al.: (Clinical observations on the Japanese encephalitis in Fukuoka district in autumn 1949; age distribution.) *Fukuoka Igaku Zasshi, Japan, 40:* 245, 1949.

18504. Neumayer, E., and D. Seemann: Das Problem der medikamentösen Behandlung des Parkinsonsyndroms. *Wien. med. Wschr., 105:* 874-877, 1955.

18505. Noguchi, Sh.: (Cerebral findings of senile progressive paralysis.) *Seishin Shinkei Gakai Zasshi, Tokyo, 50:* 16, 1948.

18506. Pennybacker, J.: Intracranial tumors in the aged. *Edinb. med. J., 56:* 590, 1949.

18507. Peszczyński, M.: Prevention of falls in the hemiplegic patient. *Geriatrics, 11:* 306-311, 1956.

18508. Plevko, O.: (Newer methods of physical therapy in the treatment of paralysis.) *Med. glasn., 9:* 358-362, 1955.

18509. Pollock, L. J.: Behavior and treatment of strokes in later life. *Med. Clin. N. Amer.,* (Chicago No.), —: 211-221, 1956.

18510. Radó, J.: (A case of Waterhouse-Friedrichsen syndrome of pneumococcal origin in old age.) *Orv. Hetil., 96:* 1284-1287, 1955.

18511. Rupp, C.: Trends in research on the aging nervous system. *J. Amer. geriat. Soc., 4:* 365-372, 1956.

18512. Schwab, R. S.: Treatment of Parkinson's disease in the aged. *J. Amer. geriat. Soc., 3:* 491-497, 1956.

18513. Seki, M.: (Clinical studies on the autonomic nervous system in the aged. I. Tests of autonomic nervous system.) *Acta geront. jap.,* (19th series), 95, 1949.

18514. Seki, M.: (Clinical studies on the autonomic nervous system in the aged. II. Influence of the autonomic nervous system toxin on the blood picture of old persons.) *Acta geront. jap.,* (19th series), 102, 1949.

18515. Seki, M.: (Clinical studies on the autonomic nervous system in the aged. III. Response to acetylcholin in old persons.) *Acta geront. jap.,* (19th series), 117, 1949.

18516. Shibata, E.: (Studies on the cells of various organs by means of Feulgen's reaction. I. Changes with aging in human Purkinje's cells.) *Jap. J. legal Med., 3:* 198, 1949.

18517. Tauchi, H., and H. Katsuji: (Supplementary studies on the pathology of Japanese B encephalitis. Especially on the histogenesis of changes in the brain and some considerations according to age.) *Nagoya med. J., 1:* 19-28, 1953. *Abstr: B. A., 28:* No. 18909, 1954.

18518. Tauchi, H., T. Nakamura, M. Takeya, K. Hayashi, and T. Morikawa: (Age to age observations upon the pathological change of *encephalitis Japonica.*) *Nagoya Igaku Zasshi, 64:* 218, 1950.

18519. Treanor, W. J., R. B. Pearson, R. C. Psaki, and E. Dehne: Potential reversibility of the hemiplegic gait. *U. S. Armed Forces med. J., 7:* 179-191, 1956.

18520. Tsubaki, T.: (Clinical pathological studies on the nervous diseases of the aged. (2) Relationship between cerebral arteriosclerosis and nervous symptoms.) *Nou to Shinkei, Tokyo, 3:* 330, 1949.

18521. Tsubaki, T.: (Clinical-pathological studies on the nervous diseases in the aged. (3) A statistical survey upon findings of the brain of old persons.) *Nou to Shinkei, Tokyo, 5:* 229, 1951.

18522. Tubaki, T., and Y. Kuroyuwa: (Studies on the nervous diseases in the aged. (1). A statistical survey on cerebral findings in the aged. (2). Clinical-pathological survey on apoplexy.) *Seishin Shinkeigaku Zasshi, Tokyo, 51:* 36, 1950.

18523. Vattuone, G.: Cura antibiotica delle sindromi Parkinsoniane, delle coreoatetosi croniche, dell'epilessia; nota preventiva. *Minerva med., Torino, 46:* 1976-1978, 1955.

See also Nos. 18254, 18258, 18835.

XI. Reactions of the Body as a Whole

(allergy, anoxia, anesthesia, anthropometry, drugs, exercise, immunity, sleep, and temperature regulation)

18524. Aimi, S., S. Yasozima, M. Sugai, J. Sato, T. Sakai, and Y. Nakazima: (Biometrical studies on normal internal organs of the Japanese. III. Ratio of weight of internal organs to body weight, at various ages.) *Trans. Soc. path. jap., 40:* 127, 1951.

18525. Badger, G. F., J. H. Dingle, A. E. Feller, R. G. Hodges, W. S. Jordan, Jr., and C. H. Rammelkamp, Jr: A study of illness in a group of Cleveland families. II. Incidence of the common respiratory diseases. *Amer. J. Hyg., 58:* 31-40, 1953. *Abstr: B. A., 28:* No. 4028, 1954.

18526. Bell, S.: Predisposing factors in tick-borne relapsing fever in Meru District, Kenya. *Trans. roy. Soc. trop. Med. Hyg., 47:* 309-317, 1953. *Abstr: B. A., 28:* No. 11576, 1954.

18527. Bennet, L. R., S. M. Castain, J. S. Flint, R. A. Hansen, and A. E. Lewis: Late effects of roentgen irradiation. I. Studies on rats irradiated under anoxic anoxia. *Radiology, 61:* 411-419, 1953. *Abstr: B. A., 28:* No. 7895, 1954.

18528. Campbell, F. L.: Relative susceptibility to arsenic in successive instars of the silkworm. *J. gen. Physiol., 9:* 727, 1926.

18529. Chernin, E.: Problems in tropical public health among workers at a jute mill near Calcutta. II. A study of intestinal parasites in the labor force. *Amer. J. trop. Med. (Hyg.), 3:* 94-106, 1954. *Abstr: B. A. 28:* No. 21551, 1954.

18530. Djourichitch, M.: Quelques caracteristiques de la grande épidémie de typhus survenue, au cours du printemps et de l'été 1942, chez le réugiés sur les bordes de la Drina en Yougoslavie. *Bull. Soc. path. exot., 46:* 286-287, 1953. *Abstr: B. A. 28:* No. 16553, 1954.

18531. Duran-Reynals, F., and P. M. Freire: The age of the tumor-bearing hosts as a factor conditioning the transmissibility of the Rous sarcoma by filtrates and cells. *Cancer Res., 13:* 376-382, 1953. *Abstr: B. A., 28:* No. 3586, 1954.

18532. Feig, M.: Epidemic Shigella gastroenteritis (bacillary dysentery) in an endemic area. II. Age-specific clinical aspects. *Pediatrics, 11:* 145-153, 1953. *Abstr: B. A., 28:* No. 1543, 1954.

18533. Fink, M. A., and V. A. Quinn: Antibody production in inbred strains of mice. *J. Immunol., 70:* 61-67, 1953. *Abstr: B. A., 28:* No. 1290, 1954.

18534. Freire, P. M., and F. Duran-Reynals: The development of metastases from the *Rous sarcoma* in relation to some characteristics of its causative virus. *Cancer Res., 13:* 383-385, 1953. *Abstr: B. A., 28:* No. 3594, 1954.

18535. Guyon, L., L. Chedid, and F. Boyer: Action d'une endotoxine bactérienne chez le rat nouveau-né. *Ann. Endocrin., Paris, 13:* 752-759, 1952. *Abstr: B. A., 28:* No. 21482, 1954.

18536. Hanamura, Y.: (Age chances of various biometrical indices at the head, face, external nose, and auricles after the adolescence of the people in Kagashima Pre.) *Kagoshima Igaku Zasshi, 25:* 142, 1952.

18537. Hitoshi, M., M. Watanabe, and T. Hukuhara: (On the daily variation, sex difference, and individual difference of body temperature in the old age.) *Hiroshima Igaku, 4:* 588, 1951.

18538. Hujimori, M.: (Anesthesia of children and old people.) *Rinsho, Tokyo, 4:* 272, 1951.

18539. Jones, F. E., C. S. Smith, and D. E. Eyles: Epidemiological study of *Endamoeba histolytica* and other intestinal parasites in the New Hope community of Tennessee. *Amer. J. trop. Med. (Hyg.), 3:* 266-275, 1954. *Abstr: B. A., 28:* No. 24127, 1954.

18540. Kato, Sh., and I. Sakamoto: (Evolution and involution in the biometrical factors at different ages.) *Numata Kenkyujo Kiyo, Himeji, 3:* 4, 1950.

18541. Keys, A.: Relative obesity and its health significance. *Diabetes, 4:* 447-455, 1955.

18542. Kitaoka, M., and T. Miura: (Influence of passing summer in 1948 upon neutralising antibodies in circulating blood on inhabitants in Tokyo, especially difference due to age.) *Nihonnoen, Tokyo,* 1948-1949, 89, 1950.

18543. Kitaoka, M., and T. Miura: Geographical distribution of neutralizing antibody against poliomyelitis virus "Lansing" strain on human sera collected in various parts of Japan. *Jap. med. J., 4:* 215-221, 1951. *Abstr: B. A., 28:* No. 21527, 1954.

18544. Kitaoka, M., K. Okubo, T. Miura, S. Baba, and H. Murakami: (Locality and age distribution of the virus of Japanese encephalitis, its neutralising antibody, and complement fixing antibody at Tohoku and Hokkaido districts in 1948.) *Nihonnoen, Tokyo,* 1948-1949, 234, 1950.

18545. Kraus, H., B. Prudden, and K. Hirschhorn: Role of inactivity in production of disease-hypokinetic disease. *J. Amer. geriat. Soc., 3:* 463-471, 1956.

18546. Kubo, I., and H. Yoshimura: (Age difference of bacteriocidic capacity of the blood and of other related blood factors.) *Acta haemat. Japonica, Kyoto, 11:* 144, 1948.

18547. Lasagna, L.: Drug effects as modified by aging. *J. chronic Dis., 3:* 567-574, 1956.

18548. McGhee, R. B.: The influence of age of the animal upon the susceptibility of mammalian erythrocytes to infection by the avian malaria parasite *Plasmodium lophurae. J. infect. Dis., 92:* 4-9, 1953. *Abstr: B. A., 28:* No. 11362, 1954.

18549. Mizutani, K.: (Radiological studies on aging people.) *Nihon Seikeigeka Gakai Zasshi, Tokyo, 25:* 23, 1951.

18550. Nevskaia, T. L.: (Toxicity of novocain in various age groups in animals.) *Farm. i Toksikol, 18:* 52-55, 1955.

18551. Nishikawa, I.: (Test for fatigue in the aged.) *Acta geront. jap.,* (22nd series), 137, 1951.

18552. Nöcker, J., and V. Böhlau: Abhängigkeit der Leistungsfähigkeit vom Alter und Geschlecht. *Münch. med. Wschr., 97:* 1517-1522, 1955.

18553. Okayasu, K.: (Studies on regulation of body temperature at various ages.) *Bull. res. Inst. diathetic Med., Japan, 1:* 166, 1950.

18554. Okayasu, K.: (Studies on the regulation of body temperature at various ages. IV. Effects of warming and cooling following warming upon the body temperature.) *Bull. res. Inst. diathetic Med., Japan, 1:* 201, 1951.

18555. Okayasu, K.: (Studies on the regulation of body temperature at various ages. V. Seasonal changes of rectal and skin temperatures during sleep.) *Bull. res. Inst., diathetic Med., Japan, 1:* 348, 1951.

18556. Parfentjev, I. A.: Frailty of old age and bacterial allergy. *Geriatrics, 11:* 260, 262, 1956.

18557. Piatti, A., and L. Teseo: Le rinopatie allergiche nell'età senile. *Gior. Geront., 4:* 165-175, 1956.

18558. Sato, J., and S. Aimi: (Studies on the normal weight of internal organs of the Japanese dead by accident.) *Trans. Soc. path. jap., 39:* 338, 1951.

18559. Seki, M.: (Specific gravity of internal organs in the aged and the change in rabbits according to age.) *Acta geront. jap.* (22nd series), 141, 1951.

18560. Steward, D. F., and J. McL. Gordon: Studies on resistance of sheep to infestation with *Haemonchus contortus* and *Trichostrongylus spp.* and on the immunological reactions of sheep exposed to infestation. VI. The influence of age and nutrition on resistance to *Trichostrongylus colubriformis*. *Aust. J. agric. Res., 4:* 340-348, 1953. *Abstr: B. A., 28:* No. 19672, 1954.

18561. Sullivan, R. L., and D. S. Grosch: The radiation tolerance of an adult wasp. *Nucleonics, 11:* 21-23, 1953. *Abstr: B. A., 28:* No. 4992, 1954.

18562. Unger, L.: Chronic bronchial asthma in the older age group. *Med. Clin. N. Amer.,* (Chicago No.), —: 115-134, 1956.

18563. Valentin, H., H. Venrath, H. von Mallinckrodt, and M. Gürakar: Die maximale Sauerstoffaufnahme in den verschiedenen Altersklassen. Eine praktisch wichtige Herz-Kreislauffunktionsprüfung im Vita-maxima-Bereich. *Z. Altersforsch., 9:* 291-309, 1956.

18564. Wilson, T. S.: Disturbed nights in the elderly. *Med. Pr., 234:* 373-376, 1955.

18565. Yasuzawa, K.: (Age changes of biometrical figures in male adults.) *Kaibogaku Zasshi, Tokyo, 27:* 60, 1952.

18566. Yoshida, T.: (Two step test for the old person.) *Acta geront. jap.,* (24th series), 163, 1953.

18567. Anonymous: Weight standards. *Nutrit. Rev., 14:* 45-47, 1956.

18568. Anonymous: Pathologic effects of atomic radiation. *Science, 124:* 60-63, 1956.
See also Nos. 18332, 18384, 18860.

XII. Reproductive System

(ovaries, testis, see Endrocrine System)

18569. Dassat, P.: L'età delle boirne al primo parto (Piemonte e Regione Valle d'Aosta.) *Ricerca Sci., 23:* 827-838, 1953. *Abstr: B. A., 28:* No. 1220, 1954.

18570. De Carvalho, A.: A fecundidade masculina em São Paulo segundo a idade e o ramo do atividade, na Capital e no interior do Estado. *Rev. brasil. Estatist., 16:* 275-290, 1955. *Abstr: P. I., 22:* No. 2211, 1956.

18571. Denoix, P. F., M. F. Schützenberger, and G. Viollet: Rapports entre l'âge au premier symptome et certains aspects de la vie biologique de la femme dans une série de cancers de l'uterus et du sein. *Bull. Inst. nat. Hyg., 6:* 573-584, 1951. *Abstr: B. A., 28:* No. 10215, 1954.

18572. Eaton, J. W., and A. J. Mayer: The social biology of very high fertility among the Hutterites. The demography of a unique population. *Hum. Biol., 25:* 206-264, 1953. *Abstr: B. A., 28:* No. 20132, 1954.

18573. Guttmacher, A. F.: The incidence of multiple births in man and some of the other unipara. *Obstet. Gynec., 2:* 22-35, 1953. *Abstr: B. A., 28:* No. 12759, 1954.

18574. Hayashi, M.: (On the old primipara.) *Hoken to Josan, Tokyo, 2:* 6, 1948.

18575. Hayashi, M.: (A statistical observation on old primipara for past thirteen years in our clinic.) *Joshi Igaku Kenkyu, Tokyo, 18:* 56, 1948.

18576. Hirata, M.: (Cases of operation of prolapsus uteri in the women sixty years old and over.) *Nagasaki Igaku Zasshi, 25:* 307, 1950.

18577. Kanagawa, M., M. Aoki, and E. Hayashi: (Clinical statistical observations on old and young women at the time of pregnancy, delivery, and puerperium.) *Hokkaido Sanka Hujinka Gakai Zasshi, 2:* 71, 1951.

18578. Kawahira, Y.: (Old primipara. (2) Critics of the preliminary treatment proposed by Shoji.) *Sanka to Fujinka, Tokyo, 16:* 448, 1949.

18579. Kennedy, B. J.: Effects of steroids in women with breast cancer. *In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 253-272.

18580. Klenitskii, Ia. S.: (Management of labor in older primiparae.) *Akush. gin., Moskva, —:* (5), 76-77, 1955.

18581. Kochi, Y.: (Statistical observations on the prolapse of uterus and vagina; age distribution.) *Sanka to Fujinka, Tokyo, 15:* 193, 1948.

18582. McClintock, A.: Senile contraction of the vagina. *J. med. (chem.) Sci., 50:* 17-21, 1870.

18583. Matsuura, T.: (Statistical observations on child delivery in the aged and the multipara.) *Nihon Sanka Fujinka Gakai Zasshi, Tokyo, 2:* 105, 1950.

18584. Mayer, A. J., and C. Klapprodt: Fertility differentials in Detroit; 1920-1950. *Population Stud., 9:* 148-158, 1955. *Abstr: P. I., 22:* No. 2227, 1956.

18585. Oda, A.: (A statistical survey on the maternal death in Japan, from 1939 to 1943, seen in relation to aging.) *Sanka to Fujinka, Tokyo, 15:* 42, 1948.

18586. Soop, E.: (Births by parity.) *Statist. Tidskrift, —:* (11), 640-643, 1955. *Abstr: P. I., 22:* No. 2221, 1956.

18587. Tabata, M., and M. Terashima: (Stitching method of central part of vagina for prolapse of uterus in the aged.) *Hakuai Igaku, Tokyo, 2:* 172, 1949.

18588. Taeuber, I. B.: Fertility and research on fertility in Japan. *Milbank mem. Fd. quart. Bull., 34:* 129-149, 1956.

18589. Takimoto, I.: (Course of delivery in the old primipara.) *Tokyo Ikadaigaku Zasshi, 6:* 31, 1948.

18590. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Natality. United States, and each state, and Alaska, Hawaii, Puerto Rico, and the Virgin Islands; 1954. *Vit. Statist., Spec. Rep., Nat. Summaries, 44:* (3), 47-66, 1956.

18591. Valle, G.: L'operabilità ginecologica nelle vecchie. *Minerva gin., Torino, 7:* 599-602, 1955.

18592. Weed, J. C.: Geriatric office gynecology. *J. Geront., 11:* 301-306, 1956.

18593. Yagi, T.: (A case of lactating old lady, seventy years old, and comment upon the mechanism of milk excretion.) *Rinsho Iho, Tokyo, 2:* 5, 1948.

18594. Yasui, S. (Re-examination of the indications of Caesarean operation; in the aged.) *Sanka to Fujinka, Tokyo, 15:* 163, 1948.
See also Nos. 18764, 18782.

XIII. Respiratory System

18595. Arima, K., and K. Hirakawa: (Results of thoracoplastics for serious cases of tuberculosis of the aged.) *Jap. J. thorac. Surg., 5:* 90, 1953.

18596. Arkin, A.: The differential diagnosis of chronic cough in the aged. *Med. Clin. N. Amer.,* (Chicago No.), —: 79-87, 1956.

18597. Barach, A. L.: Pathogenetic and allied influences in chronic pulmonary emphysema. *J. Amer. geriat. Soc., 4:* 517-525, 1956.

18598. Barbareschi, G.: Il polomone senile. *Gior. Geront., 4:* 103-130, 1956.

18599. Bickerman, H. A.: Senile emphysema. *J. Amer. geriat. Soc., 4:* 526-534, 1956.

18600. Borden, C., S. K. Sweany, and M. A. Lipton: Pulmonary emphysema; its pathogenesis, pathologic physiology and principles of management. *Med. Clin. N. Amer.,* (Chicago No.), —: 97-113, 1956.

18601. Bristol, L. J.: Radiological diagnosis of obstructive emphysema. *Arch. industr. Hlth., 13:* 144-146, 1956.

18602. Darling, R. C., A. Cournand, and D. W. Richards, Jr.: Studies on intrapulmonary mixture of gases. V. Forms of inadequate ventilation in normal and emphysematous lungs, analyzed by means of breathing pure oxygen. *J. clin. Invest., 23:* 55, 1944.

18603. Enomoto, T.: (Tendency of deaths due to tuberculosis in recent Nagoya city.) *Saishin Igaku, Japan, 3:* 39, 1948.

18604. Farber, S. M., R. H. Wilson, and J. D. Smith: Emphysema in chronic bronchitis and asthma; a practical therapeutic approach. *Calif. Medicine, 84:* 101-105, 1956.

18605. Fowler, W. S.: Physiologic aspects of obstructive pulmonary emphysema. *Arch. industr. Hlth., 13:* 150-153, 1956.

18606. Fujioka, Y., and K. Imao: (Tuberculosis of electric train workers—age distribution.) *Kekkaku, 24:* 198, 1949.

18607. Gianoli, A., and F. Wyss: Elektromyographische Untersuchungen der Atemmuskulatur bei Asthmatikern und Emphysematikern. *Helv. med. acta., 22:* 438-441, 1955.

18608. Ishida, J.: (Treatment of senile pneumonia.) *Jap. med. J., 35:* 1288, 1949.

18609. Ishihara, K.: (Clinical features of senile pulmonary tuberculosis.) *Jap. med. J.,* —: (1487), 3576, 1952.

18610. Ishihara, K.: (Pulmonary tuberculosis in the senile.) *Nihon Rinsho Kekaku, Tokyo, 11:* 718, 1952.

18611. Ishihara, K., Y. Harada, H. Nakajima, I. Hujiwara, and H. Watanabe: (Clinical features of senile pulmonary tuberculosis.) *Kekkaku, 27:* 569, 1952.

18613. Ishihara, K., H. Nakajima, Sy. Matsuda, and T. Takarai: (Immunological specificity of senile pulmonary tuberculosis.) *Rinsho Naika, Shonika, Tokyo, 8:* 105, 1953. Also *in: J. Jap. Soc. intern. Med., 41:* 296, 1952.

18614. Ishihara, K., H. Nakazima, and T. Takarai: (Immunological studies of pulmonary tuberculosis in the aged.) *Nippon Kekkakubyo Gakii Chugoku-Shikoku Chihokai-Kaishi, Okayama, 1:* 12, 1951.

18615. Iwazaki, T.: (Pathology of tuberculosis, especially as regards its onset in the aged.) *Saishin Igaku, Japan, 4:* 538, 1949.

18616. Keutzer, A.: Statistische Bemerkungen zur Frage der Übersterblichkeit" der Männer an Tuberkulose. *Tbk. arzt, 9:* 127, 1955.

18617. Koike, K., T. Shiozaki, and M. Hayakawa: (Observations upon the senile tuberculosis.) *Nagoya Igaku Zasshi, 54:* 308, 1951.

18618. Kondo, T.: (Clinical observations of pulmonary tuberculosis of the aged.) *Kekkaku, 25:* 512, 1950.

18619. Kuschner, M.: Pathological features of the various types of emphysema. *Arch. industr. Hlth., 13:* 147-149, 1956.

18620. Levinson, L.: Changing concepts in pulmonary emphysema. *Bull. Tufts-N. Eng. med. Center, 1:* 23-27, 1955.

18621. Montgomery, W. W., P. M. Perone, and L. A. Schall: Arthritis of the cricoarytenoid joint. *Ann. Otol., etc., St. Louis, 64:* 1025-1033, 1955.

18622. Morooka, T.: (Sex and age differences in rate of tuberculosis in 1948.) *Jap. J. Hyg., 5:* 33, 1950.

18623. Nagasawa, Y.: (Pathological studies on the senile pulmonary tuberculosis.) *Trans. Soc. path. jap., 35:* 39, 1948.

18624. Nakajima, H.: (Senile pulmonary tuberculosis.) *Yonago Igaku Zasshi, 1:* 143, 1949.

18625. Nakajima, H.: (Senile pulmonary tuberculosis. II. A hematological study.) *Acta haemat. jap. Kyoto, 13:* 200, 1950.

18626. Neufeld, O.: Pulmonary emphysema treated with pneumoperitoneum. *J. Amer. geriat. Soc., 4:* 328-335, 1956.

18627. Nye, R. E., Jr.: The treatment of chronic pulmonary disease. *GP (Kansas City, Mo.), 13:* 111-119, 1956.

18628. Paulsen, G. A.: Tuberculosis in the aged. *Arizona Med., 12:* 74, 1955.

18629. Princi, F.: Therapeutic comments on disabling emphysema. *Arch. industr. Hlth., 13:* 154-155, 1956.

18630. Rossitto, A. F.: Roentgen therapy of chronic chest symptoms in the elderly. *J. Amer. geriat. Soc., 4:* 373-379, 1956.

18631. Ryan, R. F., J. R. McDonald, and K. D. Devine: Changes in laryngeal epithelium; relation to age, sex and certain other factors. *Proc. Mayo Clin., 31:* 47-52, 1956.

18632. Sasamoto, H., T. Goto, and Sh. Katagiri: (A statistical observation of pulmonary tuberculosis in cases of persons over forty year old.) *Kekkaku, 24:* 200, 1949.

18633. Sasamoto, H., Y. Ito, and Sh. Katagiri: (Statistical surveys on the pulmonary system in individuals of forty years and over.) *J. publ. Hlth., Tokyo, 6:* 81, 1949.

18634. Segagni, E., and P. C. Gamalero: Determinazioni spirometriche nell'infanzia. I. La capacità vitale e la capacità di ventilazione volontaria massima nei bambini sani. *Minerva pediat., Torino, 7:* 1444-1455, 1955.

18635. Sunahara, M., and Sh. Osamura: (Pulmonary tuberculosis in old age.) *Nihon Rinsho, Osaka, 10:* 309, 1952.

18636. Takahashi, M.: (Recent changes in the distribution of pneumonia due to age.) *Nichidai Igaku Zasshi, Tokyo, 11:* 664, 1952.

18637. Theodore, A., A. G. Berger, and C. E. Palmer: A follow-up study of tuberculosis in former student nurses. I. Methods of locating and obtaining information from a study population of 25,752. *J. chronic Dis., 3:* 499-520, 1956.

18638. Uchida, H.: (Examination of senile tuberculosis.) *Kekkaku, 24:* 358, 1949.

18639. Wright, G. W.: Emphysema; terminology and classification. *Arch. industr. Hlth., 13:* 140-143, 1956.

See also No. 18724.

XIV. Sense Organs and Perception

18640. Bair, H. L.: Surgery for senile cataract. *Geriatrics, 11:* 203-211, 1956.

18641. Cosh, J. A.: Studies on the nature of vibration sense. *Clin. Sci., 12:* 131-151, 1953. *Abstr: B. A., 28:* No. 880, 1954.

18642. de la Rosée Graf, B.: Untersuchungen über das normale Hörvermögen in den verschiedenen Lebensaltern unter besonderer Berücksichtigung der Prüfung mit dem Audiometer. *Z Laryng., 32:* 414, 1953.

18643. De Vido, G.: Problemi di fisiopatologia e di terapia gerontologica in O.R.I. *Ann. Laring., etc., Empoli,* (Suppl. 1), 1-65, 1956.

18644. Endo, J.: (Rejuvenation of farsightedness.) *Ningen Igaku, Tokyo, 45:* 4, 1949.

18645. Francois, J., R. Wieme, M. Rabaey, and A. Neetens: L'électrophorèse sur papier des protéines hydrosolubles du cristallin. *Experientia, 10:* 79-80, 1954. *Abstr: B. A., 28:* No. 23439, 1954.

18646. Fujibayashi, Y., and M. Yamaguchi: (Statistics on the senile cataract.) *Nagoya Ichiritsu Daigaku Igaku Zasshi, 3:* 65, 1952.

18647. Fujii, S.: (Cases of senile cataract found in a mother and her daughter.) *Rinsho Ganko Iho, Tokyo, 44:* 395, 1950.

18648. Fukutake, T.: (On physiological audibility of Japanese, especially changing in aging, by means of 2-A audiometer.) *Jibi Inkoka Rinsho, Japan, 41:* 7, 1948.

18649. Fukutake, T.: (Observations on changes of hearing acuity in aging by means of continuous threshold measurement of air and bone conduction.) *Jibi Inkoka Rinsho, Japan, 41:* 12, 1948.

18650. Fukutake, T.: (Changes of organs of hearing in aging.) *Jibi Inkoka Rinsho, Japan, 42:* 42, 1949.

18651. Furuya, M.: (A statistical survey on audiobility related to aging.) *Tokyo Ikadaigaku Zasshi, 6:* 46, 1948.

18652. Harada, T.: (Examinations of the audible limit of higher frequencies at various ages of healthy individuals, especially old persons.) *J. otorhinolaryng. Soc. Japan, 54:* 101, 1951.

18653. Harada, T.: (Examination data of the audible limit of higher frequencies in healthy subjects at various ages.) *J. otorhinolaryng. Soc. Japan, 55:* 539, 1952.

18654. Harada, Y.: (Human's lens and submicroscopic density of its neighboring fibrous tissues and its changes in aging.) *Okayama Igaku Zasshi, 61:* 149, 1949.

18655. Hatakeyama, M.: (Courses of preservative treatment in two cases of otitis media in the aged.) *J. otorhinolaryng. Soc. Japan, 56:* 391, 1953.

18656. Hirata, Sh.: (Loading and intraocular pressure in the aged and glaucoma patients.) *Ganka Rinsho Iho, Tokyo, 42:* 275, 1948.

18657. Hiwatari, Sh.: (Senile changes of the eye, and eye diseases in the aged.) *Nihon Rinsho, Osaka, 10:* 324, 1952.

18658. Ješe, L.: (Cataract and its treatment.) *Med. glasn., 9:* 268-271, 1955.

18659. Kadyroza, K. K.: (Lagochilus in the treatment of glaucoma.) *Věstn. Oftal., 34:* (6), 32-35, 1955.

18660. Kawase, S.: (A case of melanosarcoma of the conjunctiva in an old individual). *Rinsho Ganka, Tokyo, 4:* 327, 1950.

18661. Kerdman, R. Ia.: (Results of higher nervous function tests in glaucoma.) *Věstn. Oftal., 34:* (6), 6-12, 1955.

18662. Koguchi, M., and Sh. Yoshikawa: (A case of inherited senile cataract.) *Rinsho Ganka, Tokyo, 4:* 173, 1950.

18663. Kohara, H.: (Time changes of staring near point at various ages.) *Ganka Rinsho Iho, Tokyo, 44:* 489, 1950.

18664. Kojima, K.: (Senile cataract and its complications.) *Ganka Rinsho Iho, Tokyo, 44:* 520, 1950.

18665. Kojima, K.: (Distribution of senile cataracts various ages.) *Rinsho Ganka, Tokyo, 5:* 299, 1951.

18666. Kojima, K.: (Studies on families of senile cataract and glaucoma.) *Rinsho Ganka, Tokyo, 5:* 347, 1951.

18667. Kure, M.: (Senile changes of the marginal plexus of the corneae capillaries.) *Rinsho Ganka, Tokyo, 5:* 150, 1951.

18668. Kuroyuwa, Y., T. Tsubaki, Y. Toyokura, and H. Nakamura: (Studies on the senses in the aged, and analysis of senses by means of factor analysis.) *J. Jap. Soc. intern. med., 40:* 280, 1951.

18669. Ljuština-Ivančič, N.: Sindrom glaukoma. *Med. glasn., 9:* 478-483, 1955.

18670. Lyda, W.: The story of diamox and glaucoma. *Northw. Med., Seattle, 55:* 161-166, 1956.

18671. Momose, M.: (Ophthalmological signs of thirteen individuals over seventy-five years old.) *Ganka Rinsho Iho, Tokyo, 42:* 97, 1948.

18672. Nakamura, Y.: (Honey comb change in senile retina macula.) *Rinsho Ganka, Tokyo, 3:* 16, 1949.

18673. Oguchi M., and S. Yoshikawa: (An inherited case of presenile cataract.) *Ganka Rinsho Iho, Tokyo, 43:* 384, 1949.

18674. Orzalesi, F.: Nuove vedute sulla eziopatogenesi della cataratta. *Gior. Geront., 4:* 195-217, 1956.

18675. Penzani, B.: Studio statistico delle percentuali dei vizi rifrattivi in 34.000 soggetti visitati presso l'Istituto di Medicina Industriale di Milano. *Rass. med. industr., 24:* 302-306, 1955.

18676. Pestalozza, G., and I. Shore: Clinical evaluation of presbycusis on the basis of different tests of auditory function. *Laryngoscope, St. Louis, 65:* 1136, 1955.

18677. Porta, C. F.: *La senescenza in otorinolaringoiatra.* L. Cappelli (Editor), Bologna, 1939.

18678. Reeh, M. J.: The glaucoma problem. *J. Lancet, 76:* 38-41, 1956.

18679. Rouher, F., and P. Tronche: Cataractes expérimentales au galactose chez le rat; essai d'un traitement médical. *Bull. Soc. franc. Ophtal., 67:* 37-41, 1954.

18680. Sato, Ch.: (Senile changes of ocular axis.) *Folia ophthal. jap., 54:* 111, 1950.

18681. Sato, T., and N. Arichi: (A survey on the number of days of treatment spent for healing of acute conjunctivitis; age distribution.) *Ganka Rinsho Iho, Tokyo,* (42nd year), 66, 1948.

18682. Serpell, G.: Diamox in the management of glaucoma. *Med. J. Aust.,* 42, *2:* 846-850, 1955.

18683. Shimizu, G.: (A case of senile desquamation of surface layer of the iris.) *Ganka Rinsho Iho, Tokyo, 44:* 85, 1950.

18684. Shimizu, G.: (So-called senile detachment of the iris.) *Nihon Ganka Kiyo, Tokyo, 1:* 24, 1950.

18685. Shimuzu, Sh.: (Ophthalmological disorders in the aged.) *Ganka Rinsho Iho, Tokyo, 43:* 97, 1949.

18686. Story, J. B.: One hundred operations for senile cataract. *J. med. (chem.) Sci., 100:* 27-43, 1895.

18687. Strauss, H., L. Linn, and M. Ostow: Electroencephalographic and neuropsychiatric observations in patients with senile cataract. *Mschr. Psychiat. Neurol., 130:* 321-327, 1955.

18688. Tagawa, S.: (On the nature of so-called presbyopia.) *Ganka Rinsho Iho, Tokyo, 46:* 728, 1952.

18689. Tanaka, Ch.: (Constitutional-medical studies on the conjunctivitis. II. Experimental studies on the change of fibrin-excretion response at various ages.) *Folia ophthal. jap., 54:* 175, 1950

18690. Tsujiyama, Y.: (The senile maculae.) *Seishin Shinkeigaku Zasshi, Tokyo, 54:* 542, 1952.

18691. Vaschide, N.: L'état de la sensibilité olfactive dans la vieillesse. *Rev. de Lar., —:* 397, 1905.

18692. Zoku, M.: (On the relation between decrease of eye-accommodation in aging and intensity of labor.) *Folia ophthal. jap., 54:* 465, 1950. See also Nos. 18761, 18955, 19054.

XV. Skeletal System

18693. Da Silva, F. A. G.: Permeabilidade do foramen caecum do osso frontal humano. *An. Fac. Farm. Odontol. Univ. S. Paulo, 10:* 311-316, 1952. *Abstr: B. A., 28:* No. 5019, 1954.

18694. Hult, L.: (Occurrence of the torticollis-brachialgia and lumbago-ischialgia syndromes in various occupational and age groups, and the probable genesis of these conditions.) *Nord. hyg. Tidskr., 35:* 147-159, 1954.

18695. Koda, H., E. Yoshikawa, and M. Yoshimura: (Age changes of the human xyphoid.) *Jap. J. legal Med., 5:* 306, 1951.

18696. Küntscher, G.: Die Behandlung des *malum coxae senile. Münch. med. Wschr., 98:* 82-83, 1956.

18697. Murakami, M., Ts. Nakayama, I. Ito, T. Miyazima, and Y. Hasegawa: (On the spinal curvature of national railway workers. I. A statistical observation. II. Age difference.) *J. transport. Med., Tokyo, 5:* 62, 1951.

18698. Peregalli, P. F.: Fratture torpide, infrazioni e crolli nel rachide pagetico. *Arch. Ortop., 68:* 712-731, 1955.

18699. Smith, C. F., D. Pugh, and H. F. Polley: Physiologic vertebral ligamentous calcification; an aging process. *Amer. J. Roentgenol., 74:* 1049-1058, 1955.

18700. Yoshikawa, E.: (Age changes of human thyroid cartilage and their application to the estimation of age.) *Jap. J. legal Med., 5:* 307, 1951. See also No. 18416.

XV-A. Skeletal System: *Bone*

18701. Branciforti, S., and V. Vecchi: Il problema del vecchio nella chirurgia ortopedica. *Acta geront., 6:* 3-19, 1956.

18702. Cugurra, F.: Ulteriori ricerche sulla azione dei farmaci antireumatici sulla permeabilità articolare *in vivo;* azione del pregnenolone e del 21-acetossipregnenolone. *Arch. ital. Sci. Farmacol., 5:* 285-186, 1955.

18703. Dechaume, J., and L. Bourrat: Troubles psychiques et crânes pagétiques. *J. Méd. Lyon, 36:* 709-714, 1955.

18704. Del Bo, M.: L'ostéite déformante de Paget et l'ostéoporose de la capsule labyrinthique; contribution à leur histopathologie. *Rev. Laryng., Oto., Rhino., 76:* 353-365, 1955.

18705. Kobayashi, T.: (Determination of age by means of x-ray examination.) *J. Radiol. phys. Ther., 1:* 146, 1951.

18706. Lichtwitz, A., R. Parlier, D. Clément, and M. Delaville: Mécanisme de l'action des stéroides hormonaux sur le métabolisme calcique dans l'ostéoporose. *Sem. Hôp. Paris, 31:* 718-726, 1955.

18707. Niccolini, G.: Vecchie a nuove teorie sul morbo di Paget. *Arch. Ortop., 68:* 587-618, 1955.

18708. Seda, H.: Doença óssea de Paget. *Brasil-méd., 69:* 624-627, 1955.

18709. Takahashi, K.: (A supplementary study on the morphological change of the pelvis due to age.) *Kyosai Iho, Tokyo, 1:* 103, 1952.

18710. Watanabe, M.: (Pathological fractures in the aged.) *Rinsho Geka, Tokyo, —:* (281), 283, 1951.

18711. Weinberg, M.: Osteoporosis; diagnosis and treatment. *J. Amer. geriat. Soc., 3:* 429-437, 1956.

18712. Whedon, G. D.: *Steroid hormones in osteoporosis. In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 221-239.

XV-E. SKELETAL SYSTEM: *Arthritis and Rheumatism**

18713. Bauer, W. (Moderator): Panel discussion on rheumatic disease. *J. Amer. geriat. Soc., 4:* 572-587, 1956.

18714. Bunim, J. J.: Arthritis in the elderly patient (osteoarthritis). *Bull. N. Y. Acad. Med., 32:* 102-115, 1956.

18715. Cover, M. S., J. N. Geleta, and E. F. Waller: The etiology of an arthritic disease of chickens. *Amer. J. vet. Res., 17:* 12-15, 1956.

18716. Dordick, J. R.: Rheumatoid arthritis in the elderly. *J. Amer. geriat. Soc., 4:* 588-591, 1956.

18717. Duthie, J. J., A. S. Dixon, and M. R. Jeffrey: Discussion on anaemia in rheumatoid arthritis. *Proc. roy. Soc. Med., 49:* 27-32, 1956.

18718. Emerson, P. A.: Pleural effusion complicating rheumatoid arthritis. *Brit. med. J., 1:* (4964), 428-429, 1956.

18719. Françon, F., J. Françon, and J. Ansay: Une localisation rare du rhumatisme chronique dégénératif: arthrite de l'articulation péronéotibiale supérieure dans une lipoarthrite sèche du genou. *Acta physiother. rheumat. belg., 10:* 158-160, 1955.

18720. Gamp, A.: Die Diphenylaminreaktion in Serum bei chronisch-rheumatischen Erkrankungen. *Med. Klinik, 50:* 2146-2149, 1955.

18721. Gobert, J.: Les arthroses non mécaniques; essai d'explication pathogénique; le rôle de la sénescence. *Toulouse méd., 56:* 619-631, 1955.

18722. Grappe, J. M.: Considérations actuelles sur le diagnostic du rhumatisme articulaire aigu. *Strasbourg-méd., 6:* 680-684, 1955.

18723. Grichener, E.: Hemoaglutinación en la artritis reumatoidea. *Sem. méd., B. Aires, 108:* 59-60, 1956.

18724. Järvinen, K. A. J., and T. Kumlin: Carcinoma of the lung stimulating early rheumatoid arthritis. *Ann. rheumat. Dis., 13:* 52-55, 1954.

18725. Kalliomäki, L.: The histamine-eosinophil test in rheumatoid arthritis and rheumatic fever. *Acta rheumat. scand., 1:* 1-6, 1955.

18726. Mendelek, V.: Polyarthrite chronique évolutive au cours d'une recto-colite hémorragique et purulente; chrysothérapie. *Rhumatologie, —:* (5), 181-183, 1955.

18727. Mené, G., and M. Cossu: Poliadenopatia giganto-follicolare associata a poliartrite cronica primaria. *Policlinico (sez. prat.), 62:* 1397-1404, 1955.

18728. Parade, G. W.: Endokrinium und Rheumatismus. *Medizinische, Stuttgart, —:* (45) 1561-1567, 1955.

18729. Pond, M. H.: 17-Ketosteroid excretion in two unusual forms of rheumatoid disease. *Ann. rheumat. Dis., 13:* 67-69, 1954.

18730. Ruelle, M.: A propos de l'association silicose-polyarthrite. *Rhumatologie, —:* (5), 193-199, 1955.

18731. Voit, K.: Über humorale Veränderungen beim Gelenkrheumatismus. *Med. Klinik, 50:* 1849-1851, 1955.

18732. Waller, M. V., and J. H. Vaughan: Use of anti-Rh sera for demonstrating agglutination activating factor in rheumatoid arthritis. *Proc. Soc. exp. Biol., N.Y., 92:* 198-200, 1956.
See also No. 18327.

XV-E. SKELETAL SYSTEM: *Arthritis and Rheumatism Therapy**

18733. Andrews, E. C.: The application of osteopathic principles in the management of arthritis. *J. Amer. osteop. Ass., 55:* 355-357, 1956.

18734. Bacharach, T.: The management of rheumatoid arthritis in the European theater. *Med. Bull. U. S. Army (Europe), 13:* 35-38, 1956.

18735. Bénichoux, R., P. Deslous, and G. Morin: Bilan de quatre ans de recherches du laboratoire de chirurgie expérimentale de la Faculté de Médecine de Nancy. XI. Recherches sur le traitement des arthrites rhumatismales par injection de matières plastiques au résines synthétiques. *Rev. méd. Nancy, 80:* 716-722, 1955.

18736. Boland, E. W.: Prednisone and prednisolone therapy in rheumatoid arthritis; clinical evaluation based on continuous observations for periods of six to nine months. *J. Amer. med. Ass., 160:* 613-621, 1956.

18737. Brühl, W., and H. J. Jahn: Der Insulinstoss in der Behandlung des Gelenkrheumatismus. *Dtsch. med. Wschr., 80:* 1727-1729, 1955.

18738. Cass, L. J., W. S. Frederik, and J. D. Cohen: Para-aminobenzoic acid and salicylates in the treatment of arthritis. *J. Lancet, 76:* 42-44, 1956.

18739. Kuipers, R. K. W.: Ervaringen met prednisone bij primair chronische polyarthritis. *Acta physiother. rheumat. belg., 10:* 137-144, 1955.

18740. Marassi, M., and J. Toussaint: Résultats préliminaires du traitement des P.C.E. par la métacortandracine. *Rhumatologie, —:* (4), 170-175, 1955.

* Selected references.

18741. Nunes, C. V., and A. De O. Fabrino: Artrite reumatoide; terapêutica hormonal (meticorten) e contribuição crenoterápica. *Arq. brasil. Med. nav., 45:* 271-278, 1955.

18742. Rae, J. W., Jr., and L. F. Bender: Treatment of patients with rheumatoid arthritis by physical means. *J. Amer. med. Ass., 160:* 611-613, 1956.

18743. Seneca, H.: Rheumatoid arthritis complicated by severe ulcerative colitis, successfully treated with prednisone and rauwolfia; a case history. *J. Amer. geriat. Soc., 4:* 613-615, 1956.

18744. Senise, N., and I. Bonomo: Tratamento da artrite reumatóide. *Arq. brasil. Med. nav., 45:* 333-354, 1955.

18745. Stein, I., and M. L. Beller: The orthopedic management of rheumatoid arthritis. *J. Albert Einstein med. Cent., 4:* 28-32, 1955.

18746. Traut, E. F.: Degenerative arthritis; its causes, recognition and management. *Med. Clin. N. Amer.* (Chicago No.), —: 63-78, 1956.

18747. Warter, P. J., H. L. Drezner, D. A. Donio, and S. Horoschak: Seven-year observations of the treatment of arthritis with hesperidin-ascorbic acid. *J. Amer. geriat. Soc. 4:* 592-598, 1956.

18748. Woratz, G.: Klinische Erfahrungen mit pyrogenen Substanzen, vor allem beim chronischen Gelenkrheumatismus. *Münch. med. Wschr., 97:* 1531-1534, 1955.

18749. Ziff, M., A. Kibrick, E. Dresner, and H. J. Gribetz: Excretion of hydroxyproline in patients with rheumatic and non-rheumatic diseases. *J. clin. Invest., 35:* 579-587, 1956.

XV-E. Skeletal System: *Gout**

18750. Canoa, E., and D. L. Cifuentes: La eliminación renal del ácido úrico en los gotosos con cristaluria o litiasis úricas. *Arch. esp. Urol., 11:* 165-184, 1955.

18751. Cifuentes, D. L., and E. Canoa: Sintomatología y tratamiento de la cristaluria úrica de los gotosos. *Arch. esp. Urol., 11:* 185-198, 1955.

18752. Gilston, R. J.: Gout. *GP (Kansas City, Mo.), 13:* 109, 1956.

XVI. Skin and Integument

18753. Cockett, F. B.: The pathology and treatment of venous ulcers of the leg. *Brit. J. Surg., 43:* 260-278, 1955.

18754. Galante, E., and M. J. De Auster: Tratamiento de las úlceras de los miembros inferiores con polvo de hematies. *Prensa méd. argent., 42:* 2616-2623, 1955.

18755. Izaki, M.: (Studies on the senile changes in the field of dermatology.) *Jap. J. Derm. Vener., 59:* 70, 1949.

18756. Izaki, M.: (Studies on the senile changes in the field of dermatology.) *Jap. J. Derm. Vener., 60:* 53, 1950.

18757. Kaneko, U., K. Ushiyama, and M. Yuwamoto: (A few supplements on the dermal constitution. I. Color of skin and blood pressure. II. Skin of the old person.) *Kaibogaku Zasshi, Tokyo,* —: (27), 7, 1952.

18758. Kano, Y.: (Cytological and historical studies on the sweat glands in old age and observations upon the eccrine glands of dead bodies.) *Nihon Soshikigaku Kiroku, Tokyo,* 3: 91, 1951.

18759. Light, A. E., Histological study of human scalps exhibiting various degrees of non-specific baldness. *J. investig. Dermat., 13:* 53-59, 1949.

18760. Minami, K.: (Long eyebrows as a sign of longevity; senile changes of the eyebrow.) *Jap. med. J.,* —: (1346), 383, 1950.

18761. Naniwa, T.: (Studies on the capillaries of skin in the various eye diseases. V. Findings in senile cataract patients.) *Niigata Igakukai Zasshi, Japan,* (62nd year), 296, 1948.

18762. Nishikawa, I.: (Observations on the purpura in the aged.) *Sogo Igaku, Tokyo, 6:* 1134, 1949.

18763. Onishi, K.: (Statistical observations on out-patients at the Institute of Dermatology in Osaka, especially on the change in the age distribution due to ages at the onset.) *La Lepro, Osaka, 19:* 27, 1950.

18764. Parker, R. T., C. P. Jones, and F. B. Carter: Pruritus valvae in the postclimacteric woman. *Geriatrics, 11:* 235-242, 1956.

18765. Perry, V. P., V. J. Evans, W. R. Earle, G. W. Hyatt, and W. C. Bedell: Long-term tissue culture of human skin. *Amer. J. Hyg., 63:* 52-58, 1956.

18766. Rattner, H., and C. Sutton: The aging skin. *Med. Clin, N. Amer.* (Chicago No.), —: 33-49, 1956.

18767. Roederer, J.: Les alopécies. Strasbourg-méd., *6:* 600-608, 1955.

18768. Sato, J.: (Physiological studies on the elasticity of senile skin.) *Tokyo Ikadaigaku Zasshi, 6:* 89, 1948.

18769. Sato, J.: (Comments on dermal change with age in the Japanese; a macroscope statistical observation.) *Tokyo Ikadaigaku Zasshi, 8:* 3, 1950.

18770. Sato, Y., and Sy. Suzuki: (On the age and six difference of the absorption period of skin spot quaddel.) *Rinsho Naika Shonika, Tokyo,* 3: 27, 1948.

18771. Shimauchi, T.: (Absorption period of quaddel, resistence of capillaries, and intradermal indophenol reaction in malnutrition cases of the aged.) *Sogo Igaku, Tokyo, 5:* 54, 1948.

18772. Wada, M., T. Takagaki, K. Soki, and T. Suzuki: (Relationship between age and excitability of human sweat glands by adrenalin threshold measurement.) *J. physiol. Soc. Jap., 11:* 21, 1949.

18773. Yamanaka, K.: (Pharmaceutical skin reaction in the aged.) *Acta geront. jap.,* (19th series), 131, 1949.
See also No. 18279.

XVII. Urogenital System (includes prostate)

18774. Archibald, J., and A. J. Cawley: Canine prostatectomy. *J. Amer. vet. Med. Ass., 128:* (4) 173-177, 1956.

* Selected references

18775. Atherton, L., and L. D. Atherton: Radical retropubic prostatectomy for carcinoma. *J. Urol., 75:* 111-115, 1956.

18776. Baker, R.: Management of benign prostatic hypertrophy. *Postgrad. Med., 19:* 168-176, 1956.

18777. Bouchard, R.: Le traitement du cancer de la prostate. *Progr. méd., Paris, 83:* 376-380, 1955.

18778. Brendler, H.: *Endocrine regulation of prostatic growth. In:* E. T. Engle and G. Pincus (Editors), *Hormones and the Aging Process.* Academic Press, Inc., New York, 1956, pp. 273-282.

18779. Chance, A.: Operative treatment of enlarged prostate. *J. med. (chem.) Sci., 97:* 359-362, 1894.

18780. Dolaz, E. J., R. A. Dolehide, and I. A. Friedman: Fibrinolysis in patients with metastatic carcinoma of the prostate gland. *Illinois med. J., 107:* 142, 1955.

18781. Dunaevskii, L. I.: (Indications for prostatectomy.) *Urologia, Moskow,* —: (4), 3-7, 1955.

18782. Emerson, K., Jr., and A. G. Jessiman: Hormonal influences on the growth and progression of cancer; tests for hormone dependency in mammary and prostatic cancer. *New Engl. J. Med., 254:* 252-258, 1956.

18783. Glass, S. J.: The rationale of treating benign prostatic hypertrophy with combinations of testosterone and estrogen. *J. Amer. geriat. Soc., 4:* 358-364, 1956.

18784. Gol'Dberg, V. V.: (X-ray diagnosis of cancer of the prostate.) *Urologia, Moskow,* —: (3), 24-37, 1955.

18785. Goto, T.: (Experimental studies on the seminal vesicle. I. Relationship between radiological image of the seminal vesicle and aging.) *Hiroshima Igaku, 1:* 57, 1948.

18786. Harris, R. G.: Morbidity after suprapubic prostatectomy. *Med. J. Aust.,* 42, *2:* 917-919, 1955.

18787. Hasche-Klünder, R., and A. Gaca: Neue Wege zur Behandlung des Prostata-Carcinoms. *Med. Klinik, 50:* 2032-2035, 1955.

18788. Kirkland, K.: Morbidity in retropublic prostatectomy. *Med. J. Aust.,* 42, *2:* 921-922, 1955.

18789. Langvad-Nielsen, A.: (Examination of prostatic secretion for cancer cells.) *Nord. Med., Stockholm, 55:* 52-54, 1956.

18790. Meyer, W.: Die Bedeutung der Serum-Phosphatasen für die Diagnose und Therapie des metastasierenden Prostata-Karinoms. *Medizinische, Stuttgart,* —: (43), 1514-1517, 1955.

18791. Mortensen, H.: Morbidity after prostatectomy by transurethral resection. *Med. J. Aust.,* 42, *2:* 919-921, 1955.

18792. Nagley, L.: Incontinence of urine in the aged. *Med. Illustr., 9:* 69, 1955.

18793. Newman, H. R.: New concepts in diseases of the prostate. *Canad. med. Ass. J., 74:* 159-164, 1956.

18794. Ogoshi, M.: (Urination troubles in the aged.) *J. Jap. med. Ass., 24:* 517, 1950.

18795. O'Shaughnessy, E. J., P. S. Parrino, and J. D. White: Chronic prostatitis—fact or fiction. *J. Amer. med. Ass., 160:* 540-542, 1956.

18796. Ross, J. C.: Diathermy haemostats for prostatectomy. *Lancet, 1:* 268, 1956.

18797. Sokol, J. K., and G. J. Bulkley: Disease of the prostate in the elderly male. *Med. Clin. N. Amer.* (Chicago No.), —: 249-255, 1956.

18798. Takayasu, H., Ts. Kakizaki, and Ts. Nishiura: (Urology of the aged persons. I. Urological surgery and electrocardiograms.) *Jap. J. Urol., 42:* 163, 1951.

18799. Thomley, M. W., L. M. Orr, and J. L. Campbell: The treatment of inoperable prostatic carcinoma with radioactive gold. *Sth. med. J. Birmingham, 49:* 146-149, 1956.

18800. Tobin, R.: Senile hypertrophy of the prostate. *J. med. (chem.) Sci., 105:* 529-531, 1898.
See also No. 18885.

GERIATRICS

I. General Orientation

18801. Amato, L.: La pratica della geriatria. *Longevità, 4:* 39-41, 1956.

18802. Iwatsuru, Ry.: (Specialty of geriatrics.) *Jap. med. J., —:* (1476), 2628, 1952.

18803. Morishima, K.: (Does the old person become disabled?) *Shinryo Shitsu, Tokyo, 4:* 548, 1952.

18804. Peszczyński, M.: (Medicine for aged people.) *Wiadomości lek., 1:* (1), 30-34, 1948.

18805. Takano, R.: (Geriatrics.) *Hokenigaku, Tokyo, 3:* 171, 1950.

18806. Tanaka, K.: (Geriatrics.) *Seishin Eisei, Chiba,* —: (38), 3, 1953.

II. and III. Medical Care and Diagnosis

18807. Aschenbach, E. H.: The use of metrazol in non-institutionalized elderly patients. *Med. Ann. District of Columbia, 25:* 70-72, 1956.

18808. Bellomo, A., and M. Varnier: Osservazioni e rilievi sull'impiego in geriatria di un principio attivo di cuore embrionale. *Acta geront., 6:* 37-43, 1956.

18809. Boisson, L., and L. Lareng: La prémédication chez le vieillard. *Toulouse méd., 56:* 559-603, 1955.

18810. Cavalieri, U.: La riforma del servizio sanitario negli istituti de ricovero. *Longevità, 4:* 43-46, 1956.

18811. Destrem, H.: L'hygiène du vieillard. *J. Méd. Bordeaux, 133:* 39-48, 1956.

18812. Dinken, H.: Disability in geriatrics; preventive and management. *Rocky Mtn. med. J., 52:* 272, 1955.

18813. Eckerström, S., and T. Geill: *Geriatri.* Rosenkilde & Bagger, København, 1955, 216 pp.

18814. Farris, S.: *Fire prevention and evacuation plan for nursing homes.* Mt. Carmel Hospital, Pittsburg, 1956, 31 pp.

18815. Krag, C. L.: *Better care for older people.* Dept. Hlth., Educ. & Welf., Publ. Hlth. Serv., 1954, 7 pp.

18816. Krusen, F. H.: Physical medicine and rehabilitation; its significance and relationship to other specialities in medicine. *Penn. med J., 59:* 207-210, 1956.

18817. Martucci, A. A.: Recent survey of physical medicine and rehabilitation facilities in Pennsylvania. *Penn. med. J., 59:* 214-215, 1956.

18818. Matsuo, I.: (Points of importance in the diagnosis of old patients.) *Nihon Rinsho, Osaka, 10:* 402, 1952.

18819. Minami, S.: (Medical care of the aged.) *Saisei, Tokyo, —:* (281), 23, 1951.

18820. Nishino, Ch.: (Care of old patients.) *Jap. med. J., 1297:* 416, 1948.

18821. Ozawa, S.: (Supplementary studies on the senile change of the body tissue.) *Nagoya Igaku, 66:* 107, 1952.

18822. Pria, A.: Sulla istituzione di reparti geriatrici presso i grandi ospedali. *Osped. maggiore, 43:* 340-344, 1955.

18823. Randall, O. A., H. E. Hestad, L. W. Larson, and P. Walsh: The problems of extended illness and old age. *Amer. J. Nurs., 54:* 1220-1225, 1954.

18824. Seki, M., I. Nishikawa, Y. Toyokura, and T. Maekawa: (Statistics of pathological changes at the autopsy of the aged.) *Acta geront. jap.,* (22nd series), 119, 1951.

18825. Sheldon, J. H.: Problems of geriatric care. *J. Amer. geriat. Soc., 4:* 642-647, 1956.

18826. Sluzar, W. J.: (Investigations about the action of garlic oil in the course of diseases in aged people.) *Med. Prakt., Poznań, 11:* (17), 359-364, 1938.

18827. Solon, J.: A backdrop of facts on patients and their care. *Publ. Hlth. Rep., Wash., 71:* 646-651, 1956.

18828. Takiuchi, A.: (Mass examination of old persons.) *Jap. J. publ. Hlth., 11:* 102, 1952.

18829. Tomonaga, T.: (Estimation of age in dead bodies.) *Jap. J. legal Med., 5:* 307, 1951.

18830. U. S. Department of Health, Education and Welfare. Public Health Service: A study of selected home care programs. *Publ. Hlth. Monogr., —:* (35), 3-127, 1956.

18831. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Hospital and Medical Facilities: Planning the nursing home. *Archit. Rec., —:* 222-226, 1956.

18832. Zeman, F. D.: A doctor's counsel for architects—medical facilities for the aging. *Archit. Rec., —:* 202-206, May 1956.

18833. Anonymous: Hormone therapy from pediatrics through geriatrics. *J. Tenn. med. Ass., 49:* 1-9, 1956.

18834. Anonymous: Symposium on medical problems of the aged. *Med. Clin. N. Amer.* (Chicago No.), —: 1-270, 1956.

See also No. 18215.

IV. Disease
(chronic, infectious, and mental)

18835. Aita, J. A.: Neurologic and psychiatric disorders in the older-age group. *Neb. St. med. J., 41:* 47-59, 1956.

18836. Berggren, A.: (Advancing age and disease.) *Soc. Medeel., —:* (10), 561-571, 1955. *Abstr: P. I., 22:* No. 2389, 1956.

18837. Bluestone, E. M.: The custodial case and the chronic patient. *Mod. Hosp., —:* 1-2, March 1956.

18838. Bowden, L.: The patient with incurable cancer. *J. Amer. geriat. Soc., 3:* 438-447, 1956.

18839. Breslow, L., N. Ott, and V. Chin: California's chronic disease activities. *Publ. Hlth. Rep., Wash., 71:* 453-458, 1956.

18840. Cameron, J. L., and T. Freeman: Observations on the treatment of involutional depression by group psychotherapy. *Brit. J. med. Psychol., 28:* 224-238, 1955.

18841. Fels, J.: (The symptoms of aging of old age and senility.) *Wied. lek., Warszawa, 9:* (10), 249-255, 1935.

18842. Ferguson, J. T., and W. H. Funderburk: Improving senile behavior with reserpine and ritalin. New approach with use of methyl phenylpiperidylacetate. *J. Amer. med. Ass., 160:* 259-263, 1956.

18843. Fujiwara, T., and M. Mifune: (Supplement to pictures of senile dementia.) *Okayama Igaku Zasshi,* (59th year), 37, 1947.

18844. Ginzberg, R.: Orientation in geriatric psychiatry. *J. Amer. geriat. Soc., 3:* 435-438, 1955.

18845. Hedqvist, T.: Toxoplasma infection at different ages; studied by the skin test method. *J. Hyg., Lond., 51:* 478-482, 1953. *Abstr: B. A., 28:* No. 26628, 1954.

18846. Inoue, Sy.: (Clinic of typhus, age distribution.) *Iryo, Tokyo, 1:* 29, 1948.

18847. Kimura, N.: (So-called epidemic diarrhea; age distribution.) *Jap. J. clin. exper. Med., 25:* 277, 1948.

18848. Kuroyuwa, Y., and T. Tsubaki: (Studies on the mental diseases of old persons.) *Nou to Shinkei, Tokyo, 4:* 218, 1949.

18849. Linden, M. E.: Group psychotherapy with institutionalized senile women. Studies in gerontologic human relations. II. *Int. J. group Psychother., 3:* 150-170, 1953.

18850. Linden, M. E., D. Courtney, and A. O. Howland: Interdisciplinary research in the use of oral pentylenetetrazol (metrazol) in the emotional disorders of the aged. Studies in gerontologic human relations. V. *J. Amer. geriat. Soc., 4:* 380-399, 1956.

18851. McCartney, J. L.: The treatment of the involutional and senile psychoses. *Sistema nerv., 7:* 329-335, 1955.

18852. Metrop. Life Insur. Co.: Sex and age differences in disability. *Stat. Bull. Metrop. Life Insur. Co., 37:* 1-11, May 1956.

18853. Morel, F., and J. J. Burgermeister: Mémoire et mouvement; étude de leur perturbation dans la démence sénile. *Mschr. Psychiat. Neurol., 130:* 359-374, 1955.

18854. Nagler, J. H.: Care of the terminal cancer patient. *J. Amer. geriat. Soc., 4:* 699-707, 1956.

18855. National Health Council: National health forum on chronic illness. *Publ. Hlth. Rep., Wash., 71:* 675-696, 1956.

18856. Nebraska Legislative Council: *Report of the Nebraska Legislative Council Committee on the Aged Mentally Ill.* The Council, Lincoln, Sept. 1954, No. 55, 38 pp. (Mimeogr.)

18857. Norman, C.: Senile dementia. *J. med. (chem.) Sci., 108:* 466, 1899.

18858. O'Connell, B. A.: Differential diagnosis of mental disorder in later life. *Post-Grad. med. J., 31:* 564-569, 1955.

18859. Okinaka, Sh., and T. Tsubaki: (Mental diseases in the aged.) *Nihon Rinsho, Osaka, 10:* 297, 1952.

18860. Pelner, L.: Host-tumor antagonism. I. Evidence for the existence of "tumor immunity." *J. Amer. geriat. Soc., 4:* 683-689, 1956.

18861. Pollack, B.: The addition of chlorpromazine to the treatment program for emotional and behavior disorders in the aging. *Geriatrics, 11:* 253-259, 1956.

18862. Roth, F. B.: Chronic disease care; the next milestone. *Canad. J. publ. Hlth., 47:* 32-37, 1956.

18863. Schäfer, W.: Scharlachdisposition und Lebensalter. Geschlechtsdisposition bei Scharlach. *Zbl. Bakt. (Abt. I. Orig.), 159:* 48-55; 56-63, 1952. *Abstr: B. A., 28:* No. 6487, 1954.

18864. Shalowitz, M.: Hydroxyzine: a new therapeutic agent for senile anxiety states; a preliminary report. *Geriatrics, 11:* 312-315, 1956.

18865. Shimoda, M.: (Depression in the pre-senile age.) *Jap. med J., —:* (1328), 2035, 1949.

18866. Trussell, R. E., J. Elinson, and M. L. Levin: Comparison of various methods of estimating the prevalence of chronic disease in a community; the Hunterdon County study. *Amer. J. publ. Hlth., 46:* 173-182, 1956.

18867. Tsubaki, T., and Y. Kuroyuwa: (Studies on the mental diseases of old persons. II. Correlation between arteriosclerosis of brain and clinical symptoms.) *Nou to Shinkei, Toyko, —:* (3), 219, 1949.

18868. Wayburn, E.: The challenge of chronic disease. *Calif. Medicine, 84:* 89-91, 1956.

18869. Wolff, K.: Treatment of the geriatric patient in a mental hospital. *J. Amer. geriat. Soc., 3:* 472-476, 1956.

18870. Anonymous: Conclusions and recommendations on the prevention of chronic illness. *Chron. Ill. News Letter, 7:* (2), 1-2, 1956.

See also Nos. 18217, 18423, 18479, 18503, 18529, 18530, 18539, 18703, 18807, 18893, 19015.

V. Hygiene

18871. García-Castrillo Sánchez, L.: Higiene psíquica de la senilidad. *Rev. Sanid. Hig. publ., Madr., 29:* 578-587, 1955.

18872. Goldbloom, A. A., H. B. Eiber, and L. J. Boyd: Newer clinical and laboratory studies in the aged. XIII. General Management of normal individuals after the age of 80. *J. Amer. geriat. Soc., 4:* 599-608, 1956.

18873. Hill, J.: *The virtues of sage in lengthening human life with rules to attain old age in health and cheerfulness.* The Author, London, 2nd Ed., 1764, 32 pp.

18874. Kutner, B., and W. G. Smillie: The problem of mental health among the aged. *Amer. J. publ. Hlth., 46:* 204-208, 1956.

18875. Poltowicz, K.: (La renaissance physique. Contribution à l'étude de la lutte contre la vieillesse.) *Pamiet. Polsk. Towarz. Balneolog., Kraków, 7:* 156-169, 1933. Also *in: Wied. lek., Warszawa, 7:* (5), 133-139, 1933.

18876. Rzaśnicki, A.: *(Hygiene in aged people.)* Kalendarz Zdrowia Gońca Warszawskiego, Warszawa, 1939, pp. 61-63.

18877. Sawicki, S. J.: *(Healthy old age, or else how to keep healthy till advanced age.)* Gebethner i Wolff, Warszawa, 1901, 170 pp.

18878. Wirecki, M.: *(The peculiarities of the health in aged people.)* Państwowy Zadlad Wydawnictw Lekarskich, Warszawa, 1953, pp. 572-645.

18879. Anonymous: *The best and easiest method of preserving uninterrupted health to extreme old age; established upon the justest laws of the animal oeconomy, and confirmed by the suffrages of the most celebrated practitioners among the ancients and moderns. (From a manuscript found in the library of an eminent physician lately deceased, and by him intended as a legacy to the world.)* London, England, 2nd ed., 1752, 204 pp.
See also No. 18285.

VI. Pre-mature Aging (progeria)

18880. Keay, A. J., M. F. Oliver, and G. S. Boyd: Progeria and atherosclerosis. *Arch. Dis. Childh., 30:* 410-414, 1955.

18881. Raymond F.: The relationship of the so-called family diseases to a premature physiological senescence localized to certain organic systems. *Lancet, 1:* 1859, 1908.

VII. Surgery

18882. Akutsu, K.: (Effects of laparotomy upon the electrocardiogram of old persons.) *Nihon Junkankybyo Gakii Zasshi, Tokyo, 15:* 95, 1952.

18883. Anglem, T. J., and M. L. Bradford: The evaluation of major surgery for cancer in the aged. *J. Amer. geriat. Soc., 4:* 336-340, 1956.

18884. Collins, S. D., J. L. Lehmann, and K. S. Trantham: *Surgical experience in selected areas of the United States. Data on surgical operations from periodic canvasses of households, supplemented by United States Navy reports and nationwide hospital surveys.* U. S. Govt. Print. Off, Washington, 1956, Publ. Hlth. Monog. No. 38, 48 pp.

18885. Fongi, E. G.: Aspectos metabólicos pre y postoperatorio en cirugía urológica geriátrica. *Rev. argent. Urol., 24:* 329-336, 1955.

18886. Hukuda, T.: (Upper limit of age in the indication to operation.) *Nihon Rinsho, Osaka, 10:* 241, 1952.

18887. Malan, E., S. Occhipinti, S. Serrano, and A. Aroldi: L'intervento chirurgico nel vecchio. *Gior. Geront., —:* (Suppl. 6), 5-191, 1956.

18888. Moritsch, P.: Chirurgisches Handeln nach dem 70. Lebensjahr. *Z. Altersforsch., 9:* 315-328, 1956.

18889. Pagnini, G.: Gli interventi chirurgici nella senescenza. *Ann. Laring., etc., Empoli, —:* (Suppl. 1), 67-148, 1956.

18890. Roberts, K. E., J. J. DeCosse, and H. T. Randall: Fluid and electrolyte problems in the surgery of the aged. *Bull. N. Y. Acad. Med., 32:* 180-189, 1956.

18891. Thorek, P.: Acute abdominal emergencies in the aged. *J. Amer. geriat. Soc., 3:* 477-482, 1956.

18892. Vaughn, A. M., M. S. White, and J. M. Coleman: Problems peculiar to surgery of the aged. *J. Amer. geriat. Soc., 3:* 43-490, 1956.

See also Nos. 18438, 18701.

PSYCHOLOGICAL PROCESSES

18893. Adams, J. R.: Emotional disorders in later life; an approach to treatment. *Med. Clin. N. Amer.* (Chicago No.), —: 11-19, 1956.

18894. Bennett, M. F.: *Guidance in groups.* McGraw-Hill Book Co., New York, 1955, xi, 411 pp.

18895. Caldwell, B. McD.: Psychologic correlates of sex hormone replacement in the aged; a critique. *J. Amer. geriat. Soc., 4:* 560-571, 1956.

18896. Clay, H. M.: An age difficulty in separating spatially contiguous data. *J. Geront., 11:* 318-322, 1956.

18897. Dennis, W.: Age and achievement; a critique. *J. Geront., 11:* 331-333, 1956.

18898. Dennis, W.: Age and productivity among scientists. *Science, 123:* 724-725, 1956.

18899. Fedorov, V. K.: (On the physiological mechanism of the diminution of conditioned reflexes due to old age.) *Zh. vysshei nerv. deiat., 4:* 568-573, 1954. *Abstr: P. A., 30:* No. 4321, 1956.

18900. Feifel, H.: Attitudes of mentally ill patients toward death. *J. nerv. ment. Dis., 122:* 375-380, 1955.

18901. Heglin, H. J.: Problem solving set in different age groups. *J. Geront., 11:* 310-317, 1956.

18902. Hirano, S.: (Difference with age in minimum time of visual sensation.) *J. physiol. Soc. Jap., 11:* 215, 1949.

18903. Kominami, M.: (Psychology of the aged.) *Kyoto Igakkai Zasshi, 2:* 30, 1951.

18904. Lehman, H. C.: Reply to Dennis' critique of age and achievement. *J. Geront., 11:* 333-337, 1956.

18905. Littman, R. A.: Infantile experience and adult behavior in the white rat. *J. genet. Psychol., 88:* 11-24, 1956.

18906. Malaise, E. V.: Studien über Wesen und Grundlagen seniler Gehstörungen. *Arch. Psychiat., 46:* 902, 1910.

18907. Milburn, A. A.: Personality disorganization and dysfunction of the cerebral arteriosclerotic patient. *W. Va. med. J., 51:* 73, 1955.

18908. Murai, Y.: (Mental constitution, age and social factors.) *J. publ. Hlth., Tokyo, 8:* 3, 1950.

18909. Sawa, Jy.: (Psychiatric studies by means of Pfister's picture test in the aged.) *Seishin Shinkei Gakai Zasshi, Tokyo, 50:* 20, 1948.

18910. Scott, J. H.: Some effects at maturity of gentling, ignoring, or shocking rats during infancy. *J. abnorm. (soc.) Psychol., 51:* 412-414, 1955.

18911. Tachibana, K.: (Clinical-psychological studies on the old prisoner I.) *Shinrigaku Kenkyu, Tokyo, 21:* 90, 1951.

18912. Tachibana, K.: (Psychology of the aged.) *Kosei, Tokyo, 7:* 10, 1952.

18913. Thompson, D. E., Differential effects of age upon intellectual functions differing in degree of genetic conditioning. *Proc. Iowa Acad. Sci., 60:* 566-568, 1953. *Abstr: B. A., 28:* No. 20174, 1954.

18914. Toronto. Unemployment Insurance Commission. National Employment Service. Adult Counsellors: *A study of the problems of older persons counselled during the year 1954.* The Counsellors, Toronto, June 1955, 7 pp. (Mimeogr.).

See also Nos. 18519, 18842, 18853, 19047.

SOCIAL & ECONOMIC ASPECTS

I. Accidents

18915. Kobayashi, H.: (Surveys on the cause of accidental deaths in Fukuoka City in aged people.) *Med. & Biol., Tokyo, 13:* 267, 1948.

18916. Metrop. Life Insur. Co.: Home accidents kill more men than women. *Statist. Bull. Metrop. Life Insur. Co., 37:* 6-8, Jan. 1956.

II. Crime

18917. Dunham, R. E.: Factors related to recidivism in adults. *J. soc. Psychol., 39:* 77-91, 1954.

III. Demography

18918. Ceylon. Office of the Registrar General: Report of the Registrar General of Ceylon on vital statistics for 1954. Part I. Civil (H). Govt. Press, Colombo, 1955, 262 pp. *Abstr: P. I., 22:* No. 2541, 1956.

18919. Chile. Servicio Nacional de Estadística y Censos: *Algunos resultados del XII censo de población y I de vivienda obtenidos por muestreo.* The Census, Santiago, May 1955, 56 pp. *Abstr: P. I., 22:* No. 2518, 1956.

18920. Daric, J.: Le vieillissement de la population en France. *Cah. franc. Inform.*, —: (290), 1-5, 1955. *Abstr: P. I.*, 22: No. 2315, 1956.

18921. de A. Moraes, N. L.: Censo demográfico dos municípios de Araraquara e Rinção, Estado de São Paulo, realizado em 9 junho de 1949. *Rev. Serv. espec. Saúde Públ.*, 6: 1-66, 1953. *Abstr: P. I.*, 22: No. 2468, 1956.

18922. Florida. Department of Public Welfare. Division of Research and Statistics: Effect of the migration of oldsters to Florida on the old-age assistance program. *Fla. publ. Welf. News*, 18: (2), 1-44, 1955.

18923. France. Institut National de la Statistique et des Études Economiques: Problèmes de population en Afrique. *Étud. Conjonct.*, —: 711-715, Aug. 1955. *Abstr: P. I.*, 22: No. 2062, 1956.

18924. Germany. Federal Republic. Statistisches Amt.: Neue Strukturdaten über Bevölkerung und Wirtschaft. Ergebnisse der Volks-, Berufs- und Arbeitsstättenzählung vom 14.11.1951. *Saarländ. Bevölk.-Wirtsch.*, 6: 9-24, 1954. *Abstr: P. I.*, 22: No. 2323, 1956.

18925. Germany. Federal Republic. Statistisches Bundesamt: *Die Wohnbevölkerung im Bundesgebiet am* 31.12.1954 *nach Alter und Geschlecht.* Statist. Berichte, Arb. Nr. VIII/7/46, 1946, 10 pp. *Abstr: P. I.*, 22: No. 2318, 1956.

18926. Germany. Federal Republic. Statistisches Bundesamt: Die voraussichtliche Bevölkerungsentwicklung bis 1982. Ergebnisse von Vorausberechnungen der Bevölkerung im Bundesgebiet. *Statist. Bundesrepubl. Deutschland*, 119: 1-44, 1955. *Abstr: P. I.*, 22: No. 2144, 1956.

18927. Henripin, J.: Composition par âge et sécurité social. *Actualité econ.*, 31: 146-153, 1955. *Abstr: P. I.*, 22: No. 2393, 1956.

18928. Illinois. State Department of Public Health. Bureau of Statistics: The aging of Illinois' population. *Hlth. statist. Bull. (Special Release)* —: (21), 1-22, Aug. 1, 1955. *Abstr: P. I.*, 22: No. 2180, 1956.

18929. Japan. Bureau of Statistics: *Population census of 1950. Volume III. Results of the ten percent sample tabulation.* Tokyo, 1952, Part 1, 206 pp. *Abstr: P. I.*, 22: No. 2547, 1956.

18930. Japan. Bureau of Statistics: *Population census of 1950. Volume VIII. Final report.* Tokyo, 1953, 688 pp. *Abstr: P. I.*, 22: No. 2548, 1956.

18931. Jones, C. F.: Demographic patterns in the Papago Indian village of Chuichu, Arizona. *Hum. Biol.*, 25: 191-202, 1953. *Abstr: B. A.*, 28: No. 20136, 1954.

18932. Marchenko, V.: (New population data for the U.S.S.R.) *Vĕstn. Instit. Izucheniu Istorii Kulturi SSSR*, —: (1), 5-24, 1955. *Abstr: P. I.*, 22: No. 2067, 1956.

18933. Mortara, G.: Sulla dipendenza della composizione per età di una popolazione della mortalità. *Gior. Econ. annal. Econ.*, 14: 1-32, 1955. *Abstr: P. I.*, 22: No. 2023, 1956.

18934. Nielson, H. C.: *Population trends in the United States through 1975. Total United States. Census regions. Eleven western states.* Stanford Res. Inst. Menlo Park, 1955, 58 pp. *Abstr: P. I.*, 22: No. 2145, 1956.

18935. Sailer, R.: Contribution au calcul simplifié des pertes de potentiel-vie causées par l'avancement en âge de la population. *Rev. Suisse Econ. pol. statist.*, 91: 317-328, 1955. *Abstr: P. I.*, 22: No. 2026, 1956.

18936. Sentić, M.: (Average age.) *Statisticar*, —: (32), 8, 1955. *Abstr: P. I.*, 22: No. 2324, 1956.

18937. Sweden. Statistiska Centralbyrân: (Population by age, sex, and marital status; December 31, 1953). *Statist. Tidskrift*, 4: 494-495, 1955. *Abstr: P. I.*, 22: No. 2325, 1956.

18938. Switzerland. Eidgenössisches Statistisches Amt. Bureau Fédéral de Statistique: *Statistisches Jahrbuch der Schweiz 1954.* Annuaire statistique de la Suisse 1954, Basel, 1955, x, 628 pp.

18939. U. S. Bureau of the Census: *Estimates of the civilian population of states, by broad age groups; July 1, 1950 to 1954.* Curr. Pop. Rep., Washington, 1956, Series P-25, 12 pp. *Abstr: P. I.*, 22: No. 2141, 1956.

18940. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Progress in development of fertility statistics and population estimates. *Vit. Statist., Spec. Rep.*, 39: (8), 432-442, 1956.

18941. Webber, I. L.: The effect of migration on the number and distribution of the aged in Florida. *J. Geront.*, 11: 323-327, 1956.

See also No. 18954.

IV. Economic Problems

18942. Bloom, M.: *Views and ideas on aging.* Res. Counc. for Econ. Sec., Chicago, 1955, No. 103, 52 pp.

18943. Deneffe, P. J.: Die Sozialleistungen in der Bundesrepublik Deutschland und in West-Berlin. *Wirtsch. u. Stat.*, 6: 553-563, 1954. *Abstr: P. I.*, 22: No. 2392, 1956.

18944. Epstein, L. A.: Money income position of the aged; 1948 to 1955. *Soc. Sec. Bull.*, 19: 7-14, April 1956.

18945. Epstein, L. A.: Money income sources for persons aged 65 and over; December 1955. *Soc. Sec. Bull.*, 19: 15-16, June 1956.

18946. Hawkins, C. E.: Recipients of old-age assistance; income and resources. *Soc. Sec. Bull.*, 19: 3-6, April 1956.

18947. Norman, V. B.: Assets held by aged beneficiaries of old-age and survivors insurance at end of 1951. *Soc. Sec. Bull.*, 19: 3-9, May 1956.

18948. Reeder, M. W.: Age and income. *Amer. econ. Rev.*, 44: 661-670, 1954.

18949. Steiner, P.: The size, nature and adequacy of resources of the aged. *Amer. econ. Rev.*, 44: 645-660, 1954.

18950. U. S. Congress. Joint Committee on Railroad Retirement Legislation: *Economic problems of an aging population. Retirement policies and the railroad retirement system, Part 2. Report of the Joint Committee on Railroad Retirement Legislation.* U. S. Govt. Print. Off., Washington, 1953, xvii, 172 pp. *Abstr: P. I., 22:* No. 2396, 1956.

18951. U. S. Department of Health, Education and Welfare. Social Security Administration (Prepared by L. A. Epstein): *Money income sources for persons aged 65 and over; June 1955.* The Administration, Washington, Nov. 23, 1955, No. 58, 3 pp. (Mimeogr.).

18952. U. S. Department of Labor. Bureau of Labor Statistics: Influence of age on saving and spending patterns. *Mon. Labor Rev.*, —: 1-5, Nov. 1956.

See also No. 19017.

IV-B. Economic Problems: *Employment*

18953. Fukui, T.: (Old age and unemployment.) *Shakai Hoken Junpo, Tokyo*, —: (3636), 4, 1952.

18954. Geddes, E. W.: *Aging population in New Mexico. Facts on numbers and employment.* Div. Res., Dept. Govt., Univ. New Mexico, Albuquerque, 1955, No. 47, 52 pp. *Abstr: P. I., 22:* No. 2316, 1956.

18955. Hoffman, S.: Employment for the blind older worker. *In:* N. Y. Guild for the Jewish Blind, *Services for the Older Blind,* New York, 1955, pp. 67-75.

18956. New Zealand. Census and Statistics Department: *Table of working life; 1951. Male population (including Maoris).* The Department, Wellington, 1955, 16 pp. *Abstr: P. I., 22:* No. 2184, 1956.

18957. Office of Defense Mobilization. Health Resources Advisory Committee: *Production at any age.* U. S. Govt. Print. Off., Washington, 1956, 7 pp.

18958. Stern, J.: Possible effects of automation on older workers. *Voc. guid. Quart., 4:* 41-45, 1955-56. *Abstr: P. A., 30:* No. 5305, 1956.

18959. U. S. Department of Health, Education and Welfare. Social Security Administration: *Old-age and survivors insurance.* Bur. Old-Age & Surv. Insur., Div. of Prog. Anal., 1956, 1 pp. (Mimeogr.).

18960. U. S. Department of Labor. Bureau of Employment Security: *Employment security manual; services to older workers.* The Bureau, Washington, 1951, Part II, Sect. 8500-8699.

18961. U. S. Department of Labor. Bureau of Employment Security: *Facts about older workers.* The Bureau, Washington, 1954, 18 pp.

18962. U. S. Department of Labor. Bureau of Employment Security: *Older applicants at public employment offices; special survey, November 1954.* The Bureau, Washington, March 1955, 33 pp.

18963. U. S. Department of Labor. Women's Bureau: *Hiring older women.* U. S. Govt. Print. Off., Washington, 1951, No. 12.

18964. U. S. Department of Labor. Women's Bureau: *Over forty and looking for a job?* U. S. Govt. Print. Off., Washington 1952, No. 13.

18965. Van Zonneveld, R. J.: (Observations on the problem of old age, and particularly on elderly workers.) *Mens. Onderneming, 7:* 182-197, 1953. *Abstr: P. I., 22:* No. 2385, 1956.

18966. Williamson, L. C.: Senior workers please employers. *Employm. Sec. Rev., 22:* (5), 3-5, 1955. *Abstr: P. A., 30:* No. 4331, 1956.

18967. Anonymous: *The untapped pool of labor; the older worker.* Prentice-Hall, Inc., New York, March 24, 1956, Special Report, Sect. 3, 12 pp.

See also Nos. 18914, 18968.

IV-C. Economic Problems: *Retirement and Pensions*
(See also Social Security)

18968. Chicago Heart Association: *Problems of retirement in industry.* The Association, Chicago, 1956, 64 pp.

18969. Douglas, M.: *A preparation for retirement program.* Res. Counc. Econ. Sec., Chicago, 1955, No. 109, 8 pp.

18970. Fairman, C.: Retirement of federal judges. *Harv. law Rev., 51:* 397-443, 1938.

18971. Johnson, H. J.: Thinking ahead; the problems of retirement. *Harv. Bus. Rev., 34:* 1-21, March-April 1956.

18972. Kentucky, University of. Kentucky Agricultural Experiment Station; and U. S. Department of Agriculture: *Farmers' plans for economic security in old age.* The University, Lexington, 1955, Bull. No. 626, 33 pp.

18973. Linton, M. A.: Variable annuities. *Amer. econ. Sec., 12:* 9-25, Dec. 1955.

18974. McGill, D. M. (Editor): *Pensions; problems and trends.* Richard D. Irwin, Inc., Homewood, Ill., 1955, 211 pp.

18975. New York. State Commission on Pensions: *Report . . . on supplementation or coordination of social security coverage and benefits of state employees' retirement system; 1956. (Legislative Document No. 13, 1956).* Williams Press, Inc., Albany, 1956, 49 pp.

18976. Pressey, S. L.: Certain findings and proposals regarding professional retirement. *Amer. Ass. Univ. prof. Bull., 41:* 503-509, 1955. *Abstr: P. A., 30:* No. 4326, 1956.

18977. Schmidhauser, J. R.: Compulsory retirement revisited. (Editorial). *Geriatrics, 11:* 316-318, 1956.

18978. Streib, G. F.: Morale of the retired. *Soc. Probl.*, —: 270-276, April 1956.

18979. Super, D. E.: Getting out of an occupation. *Personnel & guid. J., 34:* 491-493, April 1956.

18980. Titmuss, R. M.: Pension systems and population change. *Polit. Quart., Lond., 26:* 152-166, 1955. *Abstr: P. I., 22:* No. 2395, 1956.

18981. U. S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Welfare and Pension Funds: *Welfare and pension plans investigation. Hearings, 84th Congress, 1st Session, Pursuant to S. Res. 40, Continuing the authority of the Committee on Labor and Public Welfare to investigate employee welfare and pension plans and funds subject to collective bargaining. Part* 3. U. S. Govt. Print. Off., Washington, 1956.

18982. U. S. Department of Agriculture. Agricultural Marketing Service. (Prepared by I. M. Baill): *The farmer and old-age security; a summary analysis of four studies, 1951-1954.* U. S. Govt. Print. Off., Washington, 1956, No. 151, 43 pp.

18983. U. S. Department of Health, Education and Welfare. Social Security Administration: Age of wife when husband retires. *Soc. Sec. Bull.*, —: 2 pp., Dec. 1955.

18984. Anonymous: About new plans for veterans' pensions. *U. S. News, 40:* 106, April 20, 1956.

V. Education

18985. Diederich, C.: Erziehung zum Alter. *Hippokrates, 26:* 717, 1955.

VI. Housing and Care

18986. Bini, V.: Centro residenziale autonomo per anziani a Ostuni. *Longevità, 4:* 47-49, 1956.

18987. Biskupska, M.: (Problems of the guardianship of aged people.) *Opiek. Spol., Warszawa, 2:* (7-8) 336-344, 1947.

18988. Council of Jewish Federations and Welfare Funds, Inc.: Financial requirements for admission to Jewish homes for aged. *Counc. Reports*, —: (1), 1-13, 1956.

18989. Dudkowa, M.: (Creation of a suitable companionship atmosphere at the asylums for the old people.) *Opick. Spol., Warszawa,* 3: (5-6), 206-210, 1948.

18990. Mathiasen, G.: Some current attempts at better buildings for the aging. *Archit. Rec.*, —: 196-202, May 1956.

18991. Mumford, L.: For older people—not segregation but integration. *Archit. Rec.*, —: 191-194, May 1956.

18992. Quintarelli, L., and A. Torresini: *Casa di Riposo San Lorenzo Centro Geriatrico Communale.* Sorteni, Venice, 1955, 43 pp.

18993. Randall, O. A.: Changing needs of older people —improved homes for the aged. *Archit. Rec.*, —: 208-212, May 1956.

18994. Saito, Ry.: (The world of so-called old people's home.) *Seishin Eisei, Chiba,* —: (38), 4, 1953.

18995. Selwyn-Clarke, S.: Old folks at home; the kinds of help they need. *Lancet, 1:* 94-95, 1956.

18996. U. S. Congress. Senate. Committee on Banking and Currency. Subcommittee on Housing: *Housing for the aged. Staff report.* U. S. Govt. Print. Off., Washington, 1956, 70 pp.

18997. U. S. Housing and Home Finance Agency: *How our older people are housed.* The Agency, Washington, 1952, 9 pp.

18998. University of Denver. Bureau of Business and Social Research. (Prepared by F. L. Carmichael): *How to make and use local housing market surveys.* U. S. Govt. Print. Off., Washington, 1954, 106 pp.

18999. Vivrett, W. K.: The environmental problems of life in old age and our evolving social consciousness. *Northw. Archit., 20:* 44-65, March-April 1956.

19000. Vivrett, W. K.: No single solution covers everything—the new program and the architect. *Archit. Rec.*, —: 212-217, May 1956.

19001. Anonymous: *National directory of facilities for the aging.* F. A. Riley & Co., San Antonio, Texas, 1956, 310 pp.

See also Nos. 18216, 18217, 19007, 19059.

VIII. Medical Care

19002. Brewster, A. W., and D. McCamman: *Health costs of the aged.* Div. Res. & Statist., DHE&W, Washington, May 1956, No. 20, x, 126 pp. (Mimeogr.)

19003. Cicco, A., P. M. Densen, and D. G. Horvitz: On the association between health and social problems in a population. I. Methods and preliminary findings. *Milbank mem. Fd. quart. Bull., 31:* 265-290, 1953. *Abstr: B. A., 28:* No. 5036, 1954.

19004. Tickton, S. G.: *Government payments to the aged or for their public care in the state of New York; in the past, at present, and a decade ahead.* Seventh Co., Inc., New York, 1956, 86 pp.

19005. U. S. Department of Health, Education and Welfare. Public Health Service. (Prepared by G. St. J. Perrott, A. Ciocco, G. Baehr and L. S. Rosenfeld): *Illness and health services in an aging population.* U. S. Govt. Print. Off., Washington, 1953, No. 170, 68 pp.

19006. U. S. Department of Health, Education and Welfare. Social Security Administration. (Prepared by D. McCamman and A. W. Brewster): *Blue Cross provisions for retired persons.* The Administration, Washington, June 21, 1955, No. 23, 6 pp. (Mimeogr.).

See also No. 18836.

IX. Social Problems
(includes social adjustment)

19007. Aldridge, G. J.: The role of old people in a Florida retirement community. *Geriatrics, 11:* 223-226, 1956.

19008. Biskupska, M.: (The ways for the improving of the old people's fate in Poland.) *Spoleczny, Warszawa,* 3: (5-6), 198-206, 1948.

19009. Ikegawa, K.: (Problems of the aged in England.) *Hoken, Tokyo, 17:* 7, 1951.

19010. McCann, C. W.: *Long Beach senior citizens survey. Commun. Welf. Counc.*, Long Beach, Calif., 1955, 59 pp.

19011. Maine. Committee on Aging: *Golden years.* The Committee, Augusta, 1954, 36 pp.

19012. Pagani, A.: La partecipazione sociale degli anziani. *Longevità 4:* 33, 1956.

19013. Rancati, A.: Itinerari e interviste. *Longevità, 4:* 34-38, 1956.

19014. St. Louis. Catholic Charities: *Older people in the family, the parish and the neighborhood; a study of St. Philip Neri Parish, St. Louis, Missouri.* The Charities, St. Louis, 1955, 67 pp.

19015. Tallent, N., and D. Lucas: Socialization of the aged; a study of chronically ill men in a veterans administration center. *Geriatrics, 11:* 266-272, 1956.

19016. Varchaver, C.: *Older people in the Detroit area and the retirement age.* William B. Erdmans Publ. Co., Grand Rapids, 43 pp.

19017. Winnipeg, Canada. Committee on Services for the Aged: *Age and opportunity.* Welf. Counc. of Greater Winnipeg, 1956, vi, 66 pp.

19018. Young, R. H.: Problems of an aging population. *Med. Clin. N. Amer.* (Chicago No.), —: 3-10, 1956

See also No. 18978.

X. Social Groups

19019. Duchéne, H., M. P. Schultzenberger, J. Biro, and B. Schmitz: Particularités de l'écart d'age des couples dont le mari est alcoolique. *Bull. Inst. nat. Hyg., 7:* 609-612, 1952. *Abstr: B. A., 28:* No. 7750, 1954.

19020. Linden, M. E.: The older person in the family. *Soc. Casework, 37:* 75-81, 1956.

19021. Tietz, C., and P. Lauriat: Age at marriage and educational attainment in the United States. *Population Stud., 9:* 159-166, 1955. *Abstr: P. I., 22:* No. 2259, 1956.

XI. Social Security

19022. Belgium, Ministère du Travail et de la Prevoyance Sociale. Office National de Sécurité Sociale: *Dixième Rapport Annuel; Exercise 1954.* The Office, Brussels, 1955, 210 pp.

19023. Berner, J. H.: (Development of social security in Norway.) *Tidssk. norske LaegeForen.,* —: 71-84, Jubileumsnummer, 1955.

19024. Doenges, J. L.: Socialized social security. *GP (Kansas City, Mo.), 13:* 133-135, 1956.

19025. Farman, C. H.: World trends in social security benefits; 1935-1955. *Soc. Sec. Bull., 19:* 18-22, May 1956.

19026. France. Ministère du Travail et de la Sécurité Sociale: *Rapport sur l'Application de la Legislation de Sécurité Sociale (Statistique du 1er Janvier 1953 au Decembre 31 1954).* Imprimerie des Journaux Officiels, Paris, 1955, 110 pp.

19027. Humphrey, H. H.: The doctor and social security. *GP (Kansas City, Mo.), 13:* 135-139, 1956.

19028. Jodin, R., and J. Mignon: Médecine et sécurité sociale en Allemagne de l'Ouest. *Concours méd., 78:* 77-87, 1956.

19029. Kemp, W. H.: Social security. *GP (Kansas City, Mo.), 13:* 139-140, 1956.

19030. Malkasian, H. A.: Social security for lawyers; the profession should not be excluded. *Amer. Bar Ass. J., 41:* 1129-1132, 1955.

19031. Norwegian Joint Committee on International Social Policy: *Social insurance in Norway.* The Committee, Oslo, 1955, 115 pp.

19032. Rogel, R.: Le financement de la sécurité sociale. *Sem. méd. profess., Paris, 31:* 1440-1442, 1955.

19033. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Public Assistance: *Public assistance under the Social Security Act; old-age assistance, aid to dependent children, aid to the blind, aid to the permanently and totally disabled.* The Bureau, Washington, 1955, 21 pp.

19034. U. S. Department of Health, Education and Welfare. Social Security Administration: Annual statistical supplement. *Soc. Sec. Bull., 18:* 28-80, Sept. 1955.

19035. U. S. Department of Health, Education and Welfare. Social Security Administration: *Old-age and survivors insurance summary benefit data; March 1956.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Actuar. Br., Anal. Note No. 80, 1956, 8 pp. (Mimeogr.).

19036. U. S. Department of Health, Education and Welfare. Social Security Administration. (Prepared by: G. Hutchinson and A. Goldberg): *Old-age benefits in current-payment status; December 31, 1955.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Anal. Note No. 81, May 1956, 2 pp.

19037. U. S. Department of Health, Education and Welfare. Social Security Administration. (Prepared by: G. Hutchinson and A. Goldberg): *Number of aged persons receiving old-age and survivors insurance benefits and number receiving old-age assistance payments for 1,000 persons aged 65 and over.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Anal. Note No. 82, May 1956, 5 pp.

19038. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Public Assistance: *Old-age assistance; provisions on responsibility of relatives for support of applicants and recipients, 51 states, October 1952.* The Bureau, Washington, 1954, 16 pp.

19039. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Public Assistance: *Assistance payments under state-federal programs; September 1954.* The Bureau, Washington, 1955, 16 pp.

19040 U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Public Assistance: *Recipients of old-age assistance in early 1953. Part I. State data.* The Bureau, Washington, 1955, No. 26, 94 pp.

19041. Anonymous: Old-age benefits in current-payment status; December 31, 1955. *Soc. Sec. Bull., 19:* 16-17, June 1956.

XII. Social Service and Social Work (recreation and rehabilitation)

19042. American Association of Medical Social Workers: *Social work practicé in medical care and rehabilitation settings.* The Assoiation, Washington, 1955, 2 vols.

19043. Bamberger, L.: Rehabilitation under workmen's compensation in California. *Industr. Med. & Surg., 25:* 63-72, 1956.

19044. Cohen, W. J.: The role of welfare agencies in providing services to the aged; the role of the public agency. *J. Geront., 11:* 328-330, 1956.

19045. Hollender, M. H., et al.: *Understanding the older client.* Family Serv. Ass. Amer., New York, 1955, 64 pp. *Abstr: P. A., 30:* No. 4322, 1956.

19046. Lokshin, H.: Psychological factors in case work with blind older persons. *In:* N. Y. Guild for the Jewish Blind, *Services for the Older Blind,* New York, 1955, pp. 76-87.

19047. Lokshin, H.: Casework counselling with the older client. *Soc. Casework, 36:* 257-263, 1955. *Abstr: P. A., 30:* No. 4323, 1956.

19048. Massachusetts. Council for the Aging: *Program guide for local councils.* The Council, Boston, 1955, 22 pp.

19049. Mead, S.: Some reflections on the rehabilitative process. *Kaiser Fd. med. Bull., 3:* 230-233, 1955.

19050. North Carolina. Recreation Commission: *A manual of organization clubs for senior citizens.* The Commission, Raleigh, April 1956, No. 19, 31 pp.

19051. North Carolina. Recreation Commission: *Recreation for later maturity.* The Commission, Raleigh, 1956, 23 pp.

19052. Romero, H.: La rehabilitación en el futuro de Chile. *Rev. chile. pediat., 26:* 370-372, 1955.

19053. Snyder, R. M.: *Community activities for the aging* Res. Counc. for Econ. Sec., Chicago, 1955, No. 107, 20 pp.

19054. Solomon, A.: Recreation to meet special needs of the aged blind. *In:* N. Y. Guild for the Jewish Blind, *Services for the Older Blind,* New York, 1955, pp. 57-66.

19055. Tachibana, K.: (Proposal of gerontology for the welfare of old people.) *Seishin Eisei, Chiba,* —: (38), 2, 1953.

19056. Turner, H. (Editor): *A psychiatric approach to institutional work with the aged.* Comm. Serv. Soc. of New York, New York, Nov. 1955, 44 pp.

19057. U. S. Office of Defense Mobilization. Health Resources Advisory Committee: *Mobilization and health manpower. II. A report of the subcommittee on paramedical personnel in rehabilitation and care of the chronically ill.* U. S. Govt. Print. Off., Washington, 1956, 87 pp.

19058. Vickery, F. E.: San Francisco's senior center. *Retirement Life,* —: 2 pp., May, 1956.

19059. Wachs, M.: A day activity program in a home and hospital for the aged. *Geriatrics, 11:* 220-222, 1956.

See also Nos. 18816, 18817, 18995, 19015.

MISCELLANEOUS

19060. Albites, E.: *De consequenda et producenda senectute disquisitio.* Philippi Neri, Romae, 1790, 163 pp.

19061. Anselmus, A.: *Gerocomica sive de senum regimine opus non modo philosophis & medicis gratum, sed omnibus hominibus utile, cum privilegiis.* Fr. Ciottus, Venetiis, 1666, 292 pp.

19062. Boulding, K. E.: An application of population analysis to the automobile population of the United States. *Kyklos, 8:* 109-124, 1955. *Abstr: P. I., 22:* No. 2446, 1956.

19063. Chevalier, C.: *Le triomphe de la vieillesse, avec les moyens de faire paroître les vieillards tels qu'ils étoient dans leur jeunesse, en donnant à leur corps les forces du premier âge, & en effaçant de leurs visages toutes les rides & toutes les difformités que la caducité & la décrépitude y ont imprimées. . . . Suite du discours philosophique sur les trois principes, animal, végétal et minéral, ou la clef qui ouvre les portes du sanctuaire philosophique. . . .* The Author, Paris, 1787, viii, 111 pp.

19064. Cicero, M. T.: *Cato: or, an essay on old age.* J. Dodsley, London, 1773, 319 pp.

19065. Clarke, A.: *A practical manual for the preservation of health and the prevention of diseases incidental to the middle and advanced stages of life, particularly rheumatism, gout, stone, gravel, apoplexy, asthma, pulmonary consumption, etc.* H. Colburn, London, 1824, vi, 200 pp.

19066. Cornaro, L.: *Trattato de la vita sobria.* Gratioso Perchacins, Padova, 1558, 27 pp.

19067. Durand-Fardel, Ch.: *Handbuch der Krankheiten des Greisenalters. Aus dem Französischen übertragen und mit Zusätzen versehen von D. Ullmann.* Stahel, Würzburg, 1858, xiii, 1010 pp.

19068. Facinus, M.: *De vita libri tres, recens iam à mendis sitúque uindicati, ac summa castigati diligentia. Quorum, primus, de studiosorum sanitate tuenda; secundus, de vita producenda; tertius, de vita coelitus comparenda.* Poncetus, Paris, 1547, 288 pp.

19069. Gruman, G. J.: Doctors afield. C. A. Stephens (1844-1931)—popular author and prophet of gerontology. *New Engl. J. Med., 254:* 658-660, 1956.

19070. Guyétant, S.: *Le médecin de l'âge de retour et de la vieillesse, ou conseils aux personnes des deux sexes qui ont passé d'age de quarantecinq ans.* The Author, Paris, 1837, xvi, 487 pp.

19071. Hamilton, C. H.: *Your rewarding years.* Bobbs-Merrill Co., Indianapolis, 1955, 219 pp.

19072. Laugier, M.: Le problème de la vieillesse. II. Projet d'un schéma d'examen pour l'étude de la vieillesse. *Biotypologie, 2:* (1) 12-26, 1934.

19073. Millot, J. A.: *La gérocomie, ou code physiologique et philosophique, pour conduire les individus des deux sexes à une longue vie, en les dérobant à la douleur et aux infirmités, par une société de médecins.* F. Buisson, Paris, 1807, 494 pp.

19074. Pinsonnet, F.: *Regime de santé, pour se procurer une longue vie & une vieillesse heureuse; fondé sur la maxime de medecine. A laedentibus invantibus. Contre un livre intitulé "Le medecine de soy-méme."* M. Villery, Paris, 1686, 146 pp.

19075. Pressavin, J. B.: *L'art de prolonger la vie et de conserver la santé; ou traité d'hygiène.* J. S. Grabit, Lyon, 1786, xxxii, 354 pp.

19076. Ranchinus, F.: *Opuscula medica, utili, jocundaque rerum varietate referta.* P. Ravoud, Lugduni, 1627, 731 pp.

19077. Reyniers, J. A.: The significance of germfree life methodology (gnotobiotics) to experimental biology and medicine. *Mich. St. Coll. Vet., 13:* 178-185, 1953. *Abstr: B. A., 28:* No. 21242, 1954.

19078. Rucco, J.: *Recherches sur la prolongation de la vie humaine, et sur les moyens de donner à chaque individu une règle sûre pour se guider en état de santé ou de maladie; contenant les principes de la pathologie moderne, l'esquisse d'une nouvelle doctrine et la recette d'une liqueur appelée vitalo, à cause de son influence dans la diathèse asthénique sur les vieillards et dans les fièvres qu'on remarque principalement dans les armées et les hôpitaux.* The Author, Paris, 1812, 175 pp.

19079. Sebizius, M.: *Dissertatio de senectutis et senum statu ac conditione: instituta à Melchiore Sebizio.* Welperianis, Argentorati, 1645, 67 pp.

19080. Vaccà-Berlinghieri, F.: *Della nutrizione accrescimento, descrescimento, e morte senile del corpo umano. Si aggiunge un metodo per preservare e prolungare la vita ai vecchi, e due storie di alcuni tumori dell'abdome.* G. Pasquali, Venezia, 1801, 223 pp.

19081. Weinberg, D., and P. Grawitz: Le problème de la vieillesse. III. Une liste bibliographique des travaux sur la vieillesse. *Biotypologie, 2:* (1), 26-40, 1934.

See also Nos. 18183, 18199, 18202, 18637, 18873, 18879.

IV. MISCELLANEOUS: *Popular Articles*

19082. Berg, R. H.: Problem of the aged is still unsolved. *Look, 20:* 38-39, April 17, 1956.

19083. Desmond, T. C.: You're not old at 65. *Today's Hlth., 34:* (7), 30-32, 1956.

19084. Frank, S.: Older women make better workers. *Saturday Evening Post, 228:* 49, March 24, 1956.

19085. French, W. F.: In Los Angeles, don't call anybody superannuated. *Saturday Evening Post, 228:* 12, March 17, 1956.

19086. Goldman, R. P.: Way to longer life. *Sci. Digest, 39:* 67-70, April 1956.

19087. Schuessler, R.: Success begins at 40 plus. *Amer. Mercury, 82:* 54-57, April 1956.

19088. U. S. Department of Health, Education and Welfare. Public Health Service: *Menopause.* U. S. Govt. Print. Off., Washington, 1955, No. 179.

19089. Anonymous: Cost of security. *America, 94:* 652, March 17, 1956.

19090. Anonymous: Federation files statement with Congress, opposes lowering of retirement age for women. *Indep. Woman, 35:* 19, March 1956.

19091. Anonymous: Higher brain functions intact despite age. *Sci. Digest, 39:* 26, April 1956.

19092. Anonymous: How to retire in Florida on $2000 a year. *Look, 20:* 40-41, March 20, 1956.

19093. Anonymous: IBM sweetens its pension plan to keep technicians on the job. *Business Wk.,* —: 120, April 14, 1956.

19094. Anonymous: Mayor plans a sunny southland paradise for retired Dearborn families. *Amer. City, 71:* 173, April 1956.

19095. Anonymous: Pensions fall short of goals. *Business Wk.,* —: 43-44, March 31, 1956.

19096. Anonymous: Recreation for the retired. *Recreation, 49:* 108, March 1956.

19097. Anonymous: We've been asked who can earn what when retired. *U. S. News, 40:* 81, March 30, 1956.

See also No. 18286.

Author Index to Current Periodical Literature

(January—April—July—October 1956)

Reference is given to serial numbers

A

Abarca Zubieta, F., 15817.
Abbati, A., 17632.
Abbott, O. D., 15818.
Abe, J., 18283.
Abe, Sh., 18479.
Abély, X., 17143.
Abildskov, J. A., 15903.
Abraham, K., 16288.
Abrahamsen, H., 17085.
Abrams, A. J., 17291.
Abramson, A. S., 18120.
Achenbach, W., 17062.
Ackermann, P. G., 15811.
Adams, J. E. 18488.
Adams, J. R., 18893.
Adey, W. R., 16004.
Adinolfi, M., 16727.
Adult Education Council, 18070.
Agarwal, L. P., 17698.
Agmon, J., 15871.
Agnoletto, A., 15904.
Agostini, A., 16206, 17831.
Agostini, G., 16779.
Ahumada, J. C., 16914.
Ahvenainen, P., 16044.
Aimi, S., 18524, 18558.
Aita, J. A., 18835.
Aitken, W. A., 15974.
Akutsu, K., 18882.
Albanese, A. A., 15819.
Alberghina, G., 16930.
Albert, A., 18408.
Albert, S., 16235.
Albert, S. M., 17740.
Albertson, H. K., 17019.
Albites, E., 19060.
Albrecht, G., 16780.
Albrecht, R., 18090, 18091.
Albrecht, W., 18254.
Aldridge, G. J., 19007.
Alexander, W. R., 16157.
Allalouf, D., 15871.
Alleger, D. E., 18050.
Allen, E. B., 17938.
Allen, I. B., 18275.
Allevin, S., 16781.
Alliod, R., 18334.
Allison, A. C., 16703.
Allison, R. S., 16353.
Almaden, P., 17421.
Alman, R. W., 16865.
Almaraz Ugalde, A., 16670.
Altland, P. D., 16705.
Alvarez, L. M., 16782.
Alvarez, W. C., 16416, 16442, 16856, 16857, 17144, 17628.
Amako, F., 18276, 18480.
Amato, L. L., 16240, 17115, 18801.
American Association of Medical Social Workers, 19042.
American Geriatrics Society, 17122.
American Medical Association. Council of Medical Service. Committee on Indigent Care, 17390.
American Rheumatism Association, 17783.
Amira, A., 17021, 17830.
Amishima, Y., 18239.
Amosa, E. I., 17056.
Amulree, (Lord) B. W. S., 17123, 17880.
Ana-Horrilleno, E. S., 15932.
Andersen, A. C., 15755.
Anderson, E., 17784.
Anderson, H. J., 17540.
Anderson, J. E., 16354.
Anderson, J. T., 15866, 15888, 17509.
Anderson, O. W., 17433.
Anderson, P. J., 16704.
Anderson, R. J., 17434.
Anderson, R. N., 17353.
Anderson, W., 18492.
Anderson, W. F., 17180.
Andosca, J. B., 18409.
Andres, E., 16719.
Andrew, N. V., 16207, 17073.
Andrew, W., 16207, 17073, 17832, 18481.
Andrews, E. C., 18733.
Andrews, G. S., 17846.
Andrews, J., Jr., 18068.
Andrus, R., 16355.
Angeli, G., 15846.
Anglem, T. J., 18883.
Ansay, J., 18719.
Anselmus, A., 19061.
Antognetti, L., 15933, 16783.
Antonini, F. M., 18370.
Antunes, M. M., 16211.
Aoki, M., 18577.
Appleby, J. I., 15934.
Araújo, Moraes, N. L., 17461.
Araya, H., 18357, 18358, 18359, 18360, 18361, 18391, 18392.
Arcadi, J. A., 17560.
Archibald, J., 18774.
Arduino, L. J., 17847.
Arias, B. J., 18240.
Arichi, N., 18681.
Arima, K., 18595.
Arimoto, S., 18277.
Arkin, A., 18596.
Arnhoff, F. N., 16356.
Arnholdt, F., 17956.
Arnon, D. I., 17415.
Arnould, E., 15750, 18194.
Aroldi, A., 18887.
Aron-Brunetiere, R., 16218.
Aronoff, A., 16983.
Aronson, M., 17145.
Arrighi, L. A., 16914.
Aschenbach, E. H., 18807.
Asekoff, M., 15997.
Ashbury, T., 17588.
Askovitz, S. I., 16773.
Atherden, S. M., 16158.
Atherton, L., 18775.
Atherton, L. D., 18775.
Atkinson, H. S., 16289, 16290.
Atsumi, H., 16075.
Aubry, M., 16103.
Ausenbachs, A., 17727.
Austen, G., Jr., 17868.
Austria. Statistisches Zentralamt, 16636.
Auvert, J., 17086.
Ayre, J. E., 16228.

B

Baba, S., 18544.
Babson, P. T., 16443.
Baccarini, V., 17020.
Bacharach, T., 18734.
Bachi, R., 15718.
Badger, G. F., 18525.
Badin, J., 16141.
Baehr, G., 19005.
Baer, M. F., 16417.
Bagnall, A. W., 17785.
Baill, I. M., 18982.
Baines, A. H., 15820.
Bair, H. L., 18640.
Baker, H. D., 18071.
Baker, J. J., 16032.
Baker, J. L., 16290.
Baker, R., 18776.
Balassi, G. P., 18410.
Baldi, G. M., 16485.
Balestrieri, A., 16858.
Ballabio, C. B., 17021, 17057, 17819, 17821, 17830.
Baló, J., 18403.
Baltimore City; Commission on Aging and the Problems of the Aged, 16486.
Bamberger, L., 19043.
Bandelier, R., 16469.
Bandiera, G., 15916.
Banga, I., 18403.
Bangdiwala, I. S., 15747.
Bánkowski, M., 16931.
Banzet, P., 16346.
Barach, A. L., 16086, 16087, 18597.
Barbareschi, G., 16932, 18598.
Barber, L. E., 17907.
Barberi, B., 15762.
Barbier, J. B., 17525.
Barbieri, L. L., 15965.
Barclay, P., 15964.
Bardelli, S., 17518.
Barden, F. W., 16166.
Barillari, F., 15857.
Barker, P., 15876.
Barnes, R. H., 16362, 17905.
Barnes, R. W., 17850.
Barnett, H. A. R., 17435.
Barr, J. H., Jr., 16179.
Barral Souto, J., 18072.
Barrera, H. E., 15794.
Barrett, J. E., 18112.
Barron, J., 18278.
Barron, M. L., 16418, 18058.
Barry, J. R., 17966.
Bartfeld, H., 17786.
Barth, E., 16167.
Bartlett, M. N., 16710.
Barucci, M., 16291, 17124.
Baruch, J. Z., 18113.
Baruk, H., 16292.
Basile, E., 17963.
Basowitz, H., 16371.
Bassani, A., 18331.
Bassiouni, M., 17742.
Bastai, P., 16700, 17391.
Bastow, J., 17022, 17787.
Bastrup-Madsen, P., 16190.
Bate, G. L., 16561.
Bates, D. V., 16933.
Baud, B., 16118.
Bauer, K. M., 17848.
Bauer, R., 18073.
Bauer, R. W., 16006.
Bauer, W., 18713.
Baughn, W. H., 17996.
Baumberger, W., 17146.
Baumgartner, P. H., 16142, 16340.
Baurys, W., 17849.
Baxter, R. C., 16073.
Bay County Council of Community Services, 18074.
Bayés, C., 17795.
Baylon, H., 17541.
Bayne, J. R., 16293.
Bazex, —, 17082.
Beadenkopf, W. G., 17205.
Beamer, K. C., 17477.
Beattie, J. W., 17781.
Beauvy, L., 16135.
Beber, M., 18314.
Bechgaard, P., 16190.
Beck, C. S., 15905, 16753, 18374.
Beck, G. J., 16087.
Becka, D. M., 16006.
Becker, M. C., 16536.
Becker, R., 16934, 16961.
Beckman, R. O., 16563.
Becton, J. A., 16337.
Bedell, W. C., 18765.
Bedford, P. D., 16895.
Begley, B. J., 17856.
Beguiristain, M., 16951.
Bek, V., 16971.
Bekkarewicz, B., 15739.
Belbin, R. M., 17247.
Belgian Congo. Service des Affaires Indigènes at de la Statistique, 15795.
Belgium. Institut National de Statistique, 16503.
Belgium. Ministère du Travail et de la Prévoyance Sociale, 17436, 18092.
Belgium, Ministère du Travail et de la Prévoyance Sociale. Office of National de Securite Sociale, 19022.
Bell, J. W., 17079.
Bell, S., 18526.
Beller, M. L., 18745.
Bellomo, A., 16687, 18808.
Bellotti, R., 17070.
Bellows, M. T., 15792.
Bělohradsky, K., 16973.
Bemm, H., 16713, 18316.
Benassi, G., 17561.
Bender, L. F., 18742.
Benedetti, D., 15735.
Bénichoux, R., 18735.
Benjamin, B., 15763, 17682.
Bennet, L. R., 18527.
Bennett, E. R., 16020.
Bennett, G., 17699.
Bennett, M. F., 18894.
Bennett, R. L. 18114.
Bennett, W. A., 18424.
Benoiston, J., 17292.
Benson, R. E., 16624.
Bentzen, O., 16952.
Béraud, T., 15965.
Berberian, D. A., 15756.
Berg, B. N., 15877, 15906, 17599.
Berg, G., 18061.
Berg, R. H., 19082.
Bergen, J. R., 15946.
Berger, A. G., 18637.

Bergerot-Blondel, Y., 16784.
Berggren, A., 18836.
Bergman, H. C., 16771.
Bergman, R. T., 17850.
Bergsma, D., 17908.
Bergy, G. G., 15909.
Berlin, N. I., 17492.
Berlioz, C., 17324.
Berman, A. J., 17258.
Berndorfer, A., 17190.
Berner, J. H., 19023.
Bernier, J. L., 17074.
Bernstein, N., 17605.
Berra, A., 15911, 16092, 16728.
Berry, E. R., 15858.
Berryman, G. H., 16045.
Bertrand, A. L., 16460.
Best, W. R., 15847.
Béthoux, R., 16799.
Bétourné, C., 16125, 16241.
Bettag, O. L., 17147.
Betz, E., 17023.
Bevis, L., 17300.
Beye, C. L., 17732.
Bianchi, W., 16009.
Bickerman, H. A., 16087, 18599.
Biemond, A., 17602.
Bien, E. J., 17822.
Billingslea, F. Y., 16357.
Binas, D., 18038.
Binet, L., 15719, 15848, 16088, 16241.
Bing, L., 17300.
Bingold, K., 17148.
Bini, V., 18986.
Biondo, G., 17501.
Birke, G., 16219, 16220.
Birnberg, C. H., 15935.
Biro, J., 19019.
Birren, J. E., 16358, 16359, 16360, 16361.
Biskupska, M., 18987, 19008.
Bizzozero E., 16836, 17590.
Bjork, A., 18436.
Blair, H. A., 16073, 16619, 16620.
Blais, M. R., 17874.
Blanchaer, M. C., 17496.
Blatt, M. H. G., 17577.
Bleyer, J. M., 15937, 17566.
Bliven, B., 16688.
Bloch, E., 15946, 15962.
Blocker, C. E., 17967.
Bloom, M., 18942.
Bloom, M. T., 16419.
Bluestone, E. M., 16251, 16252, 16253, 17349, 17902, 18837.
Blum, S., 17155.
Blumberg, L., 17881.
Blumberg, N., 16976, 17499.
Blumencron, W., 17024.
Bock, R. H., 17588.
Bodansky, O., 17851.
Boegler, F., 16168.
Böhlau, V., 18552.
Boehmig, A., 16053.
Böhringer, H. R., 16960.
Bogdanikowa, B., 17743.
Boger, W. P., 15859.
Bogoch, A., 15972.
Bohatirchuk, F., 16119.
Bohlmann, A., 16837.
Boiron, M., 18301.
Boisson, L., 18809.
Boisvert, P. L., 16143.
Boivin, M., 16444.
Boland, E. W., 17788, 18736.
Boll, E. S., 17316.
Bolliger, A., 17823.
Bologna, R., 17028.
Bolt, R. J., 17882.
Bolt, W., 18212.
Bolton, W., 16564, 16613.
Boman, H. G., 16221.
Bonatti, M., 17833.
Bonessa, C., 16137, 18302.
Bonfiglie, M., 17732.
Bonomini, V., 17689.
Banomo, I., 18744.
Bontempo, C., 17427.
Bopp, A., 16993.
Borden, C., 18600.
Borkowski, I., 18437, 18468.
Borman, A., 15832.
Bornstein, S., 17903.
Bortz, E. L., 18332.
Boselli, A., 16137.
Boshes, B., 17603.
Bossard, J. H. S., 17316.
Bossi, L., 16754.
Bottiglioni, E., 18279.
Bottinelli, P., 17997.
Bottini, E., 18255.
Botwinick, J., 16360, 16361.
Boucek, R. J., 15746.
Bouchard, R., 18777.
Boucher, R. V., 18264.
Boucot, K. R., 16089.
Boucot, N. G., 16933.
Boulard, C., 15936.
Boulding, K. E., 19062.
Boulton, E. A., 17266.
Bounin, M., 16004.
Bour, H., 16088.
Boureau, M., 16349.
Bourke, J. J., 17283.
Bourlière, F., 15719, 15821, 15848, 15951, 15975, 16604, 17392.
Bourne, G. H., 16222, 18404.
Bourrat, L., 18703.
Bowden, L., 18838.
Bowden, P. W., 16268.
Bower, H. M., 17149.
Bowie, M. A., 17420.
Bowman, K. M., 17968.
Bowser, L. J., 17733.
Boyd, G. S., 17554, 18880.
Boyd, L. J., 18338, 18872.
Boyer, F., 18535.
Boyle, A. C., 16169, 17718.
Boyle, R. W., 16420.
Brace, K. C., 16705.
Bradford, M. L., 18883.
Brage, D., 17604.
Branciforti, S., 16126, 18701.
Brandes, D., 16222.
Brandfonbrener, M., 15907, 15923.
Braun, V. K., 16504.
Braunsteiner, H., 17852.
Brav, S. S., 17700.
Bravo Becherelle, M. A., 16670.
Brazil. Conselho Nacional de Estatistica, 16671, 17210, 17211, 17212.
Breckinridge, E., 16487, 17248, 17350.
Bréger, P. R., 17075.
Breil, J., 17998.
Brena, S., 17629.
Brendler, H., 18778.
Breslow, L., 16254, 16255, 16689, 17883, 18839.
Breuil, G., 16470.
Brewster, A. W., 16482, 19002, 19006.
Bricaud, H., 16127.
Brickman, W. W., 16461.
Bridgwater, A. B., 17582.
Brierley, J. B., 16008.
Brightman, I. J., 16256, 16480.
Brill, A. B., 17492.
Brine, C. I., 16683.
Bring, S. V., 15860.
Brink, E. L., 17213.
Bristol, L. J., 18601.
Bróchner-Mortensen, K., 17034.
Brock, J. F., 17543.
Broder, H. M., 17789.
Brodkin, E. T., 17076.
Brodovsky, E., 18262, 18263.
Brody, D. A., 17542.
Brofman, B. L., 15908, 16755.
Bromley, D. B., 17195.
Bronte-Stewart, B., 17543.
Brooke, E. B., 16257.
Brotherston, J. H., 17884.
Broustet, P., 16127.
Browe, J. H., 15822.
Brower, F. B., 16245, 17267.
Brown, B., 17068.
Brown, C. E., 18332.
Brown, J. A., 18115.
Brown, J. H., 16495.
Brozek, J., 15720, 16896.
Bruce, R. A., 15909, 17556.
Bruch, E., 17393.
Brühl, W., 18737.
Brüschke, G., 15878.
Brugsch, H., 17063.
Brull, L., 16592, 17394, 17395, 17729.
Brusch, C. A., 17790.
Brush, B. E., 16838.
Buck, C., 17176.
Büel, H. W., 16370.
Bugyi, B., 16839.
Buisman, P. H., 16840.
Buldain, M., 17565.
Bulkley, G. J., 18797.
Bunce, P. L., 16227.
Bunim, J. J., 18714.
Bureau of Public Assistance, 17325.
Burgees, A. M., 17519.
Burger, G. C. E., 18030.
Burgermeister, J. J., 18853.
Burma. Census Department, 17999, 18000.
Burn, G. P., 16703.
Burns, C. N., 17865, 17866.
Burns, L., 17904.
Burns, R. K., 18051.
Burstein, S. R., 16341, 18294.
Burton, D., 17562.
Bush, J. A., 17492.
Bush, L. F., 18336.
Buskirk, E., 15910.
Busse, E. W., 16362, 17905, 17951.
Busygin, A. T., 16972.
Butcher, H. R., Jr., 17077.
Butler, P., 16523, 17191.
Buttenschn, P., 17784.
Bywaters, E. G., 16983.

C

Cabanel, G., 17774.
Cabanieu, G., 16127.
Cade, S., 16294.
Caffarri, F., 16754.
Caffin, S. W., 18213.
Calandra, D., 16914.
Calcagno, I. R., 16723.
Caldwell, B. McD., 18895.
Caleffi, M. L., 17630.
Cali, A., 15879, 16727.
California. Inter-Departmental Coordinating Committee on Aging, 16488.
California. Joint Legislative Budget Committee, 16446.
California. State Department of Finance, 18001.
Callahan, B., 17268.
Callenbach, E. W., 18264.
Camera, R., 16090.
Cameron, C. A., 18195, 18196.
Cameron, D. B., 17591.
Cameron, J. L., 18840.
Cameron, N., 17906.
Campbell, E. P., 17214.
Campbell, F. L., 18528.
Campbell, J. L., 18799.
Campbell, O. P., 16505.
Candiani, M. A., 16928.
Canepa, A., 17631, 17899.
Canis, J., 17577.
Canoa, E., 18750, 18751.
Cantarutti, F., 16030.
Capó, B. G., 15747.
Capuzzo, A., 15735.
Caravaglios, F., 18214.
Cariati, A., 16785.
Carinci, M. P., 17632, 18279.
Carlier, J., 16935.
Carlo, J., 15962.
Carlotti, C., 17506.
Carlotti, G., 15735.
Carlson, E. R., 15909.
Carmichael, F. L., 18998.
Carmichael, R., 18333.
Carneiro, J. F., 17301.
Caroit, M., 16147, 16197.
Caron, M., 17952.
Carpenter, C. M., 16295.
Carreras, L., 17579.
Carrier, N. H., 17658.
Carroll, P. E., 17659.
Carstairs, G. M., 17907.
Carter, F. B., 18764.
Carter, H., 16506.
Cartwright, G. E., 17492.
Casarett, G., 16058, 17638.
Casassa, P. M., 15911, 15912, 18334.
Case, T. C., 17660.
Cass, L. J., 18738.
Castaigne, P., 16007.
Castain, S. M., 18527.
Castaing, R., 16127.
Castano, M., 16135.
Catchpole, B. N., 17791.
Cattaneo, P., 17661.
Causi, N., 15864.
Cavalieri, U., 15735, 16242, 16481, 16524, 18116, 18810.
Cavazzuti, F., 15846.
Cawley, A. J., 18774.
Cazzaniga, G., 16936.
Cebula, W., 17576.
Cecchi, E., 17744.
Cestnik, I., 16091.
Ceylon. Department of Census and Statistics, 16388, 16389, 17458.
Ceylon. Office of the Registrar General, 18918.
Chafetz, M. E., 16031, 17605.
Chaloupka, M., 18262, 18263.
Chambatte, D., 17541.
Champlin, B., 17068.
Chance, A., 18779.
Chanutin, A., 15858.
Chapius, R., 17025.
Chapman, A. L., 17908.
Chapman, I., 18338.
Charbonneau, P., 16510, 17326.
Charcot, —., 18482.
Charipper, H. A., 15968.
Charnas, T., 17284.
Charret, —., 17327.
Charron, K. C., 17885.
Charvát, J., 16973.
Chasassa, P. M., 16728.
Chasen, W. H., 17004.
Chatten, S. J. R., 16672.
Chedid, L., 18535.
Cherniack, R. M., 17676.
Chernikoff, T., 17473.
Chernin, E., 18529.
Chesnez, A. M., 16046.
Chesrow, E. J., 15937, 17566.
Chevalier, C., 19063.
Chiang, S. P., 17701.
Chicago Heart Association, 18958.
Chiesura, P., 15911, 16728.
Chikagui, H., 18207, 18208.

Chile. Servicio Nacional de Estatística y Censos, 18919.
Chilov, K., 16984.
Chin, V., 18839.
Chinn, A. B., 17150, 17591.
Chiodaroli, A., 18302.
Chipman, C. D., 15880.
Chiti, E., 17754.
Chizzolini, M., 15942.
Choffé, F., 17324, 17327.
Chope, H. D., 16689.
Chovet, M., 18439.
Chow, B. F., 17500.
Chow Wein-Pin, —., 18002.
Christensen, E. H., 17633.
Christie, A. B., 16985.
Churchill, C. W., 18069.
Chvapil, M., 17413.
Cibrie, P., 16511.
Cicco, A., 19003.
Cicero, M. T., 19064.
Cifuentes, D. L., 18750, 18751.
Ciminera, J. L., 15859.
Ciocco, A., 19005.
Cirla, E., 17021.
Citi, S., 17518.
Civic, M., 18075.
Clague, E., 17249.
Clark, C. J. 17799.
Clark, D. H., 16296.
Clark, F. L., 16421, 16422.
Clark, L. C., Jr., 17636.
Clark, M. L., 15928.
Clark, N. M., 17243.
Clarke, A., 19065.
Clarke, B. C., 17853.
Clarke, J. R., 16621.
Claussen, F., 16986.
Clay, H. M., 18896.
Clegg, E. J., 16223.
Clément, D., 18706.
Cleveland, D. A., 16962.
Clough, P. W., 17792.
Clow, H. E., 17181.
Coale, A. J., 16390, 18003.
Cobb, S., 16987.
Cocchi, M., 17969.
Cockerill, E., 17151.
Cockett, F. B., 18753.
Cognasso, A., 16316.
Cognasso, P. A., 17840.
Cohen, A., 17793.
Cohen, B. M., 18350.
Cohen, E. V., 15792.
Cohen, J. A., 15852.
Cohen, J. D., 18738.
Cohen, L. A., 17909.
Cohen, L. D., 17905.
Cohen, M. M., 16859.
Cohen, S. M., 16729.
Cohen, S. S., 17677.
Cohen, W. J., 17315, 18095, 18098, 19044.
Cohn, A. G., 16297.
Cohn, W. M., 16297.
Coke, H., 16144.
Coleman, J. M., 18892.
Colla, G., 17673.
Collins, B. G., 17351.
Collins, D. H., 16974, 17745.
Collins, S. D., 15764, 18884.
Colombo, U., 15735, 18117.
Comar, O. B., 17087.
Common, R. L., 17514.
Community Welfare Council. Group Work and Recreation Division, 18118.
Compton-James, D., 17794.
Conestabile, E., 17763.
Conley, C. L., 17482.
Connecticut Commission on the Potentials of Aging, 16489.
Conner, J. F., 16258, 16259.
Conte, M., 15975.
Coogan, T. J., 18375.
Cook, R. C., 18197.
Cooke, A. M., 16128.
Cooksey, W. B., 16260.
Cooley, D. A., 17520, 18335.
Coon, M. J., 15832, 15833, 15834.
Cooney, N. L., 17383.
Cooper, F. A., 16565.
Cooper, G. W., 16298.
Cooper, I. S., 16860, 16861, 18483.
Cooper, W. M., 17493.
Cope, T. I., 18411.
Coppez, H., 17702.
Cordaro, M., 16261.
Cornaro, L., 19066.
Cornfield, E., 16280.
Cornia, G., 16937.
Corsellis, J. A. N., 16008.
Corsi, E., 17250.
Corson, J. J., 18025.
Corssen, G., 17634.
Cosh, J. A., 18641.
Cossio, P., 15913.
Cossu, M., 18727.
Coste, F., 17746, 17747.
Cotes, J. E., 16756.
Cottafavi, M., 18412.
Cottenot, F., 16208.
Cottin, D., 16127.
Cotton, K., 16938.
Coughlan, R., 16566.
Council of Jewish Federations and Welfare Funds, Inc., 16525 18988.
Counci of State Governments, 16490.
Couper, W. J., 17269.
Cournand, A., 17681, 18602.
Courtney, D., 18850.
Couvelaire, R., 16224, 17088, 17089.
Covalt, D. A., 16526.
Covalt, N. K., 18119.
Cover, M. S., 18715.
Cowan, N. R., 17180.
Cowan, P. M., 17563.
Cox, P. R., 17215.
Craig, P. E., 16047.
Crampton, C. W., 16243.
Crasilneck, H. B., 16021.
Crawford, E. S., 17520, 18335.
Creach, —., 17292.
Creech, O., Jr., 18335.
Creevey, C. D., 17854.
Cretin, A., 16129.
Creychton, J. W., 18031.
Crick, F. H., 17564.
Critchley, MacD., 18484.
Crittenden, J., 16965, 17060.
Croft, J. D., 17544.
Croze, M., 18004.
Cruickshank, B., 16988.
Cucciati, R., 15721.
Cugurra, F., 16170, 16989, 18702.
Culp, D., 16233.
Cuming, J., 18485.
Cummins, W. J., 18280.
Cuneo, K. J., 16166.
Cuny, G., 18340.
Curran, J. A., 17279.
Currier, M. E., 17952.
Curry, B. H., 16527.
Curtis, J. K., 17678.
Curtis, T. B., 18096.
Curutchet Ragusin, J., 16851.
Cusack, J. W., 18198.
Cutler, S. J., 17153.
Cyprus. Statistics Office, 17216.
Czerski, P., 17494.
Czystohorski, T., 18309.

D

Dack, S., 15881.
Dacso, M. M., 17152.
D'Agostino, A., 17629.
Dahlberg, G., 15865.
Dale, R. A., 16770.
D'Alessandro, W., 18389.
Dalmas, H., 16915.
Dam, P., 18005.
Danbury, R., 17026.
Dancis, J., 16067.
Daneo, V., 17047, 17812.
Danesino, V. L., 15914.
Daniel, J. D., 17874.
Daniels, L. A., 16423.
Danis, M., 17702.
Darcus, H. D., 17352.
Daric, J., 16391, 18920.
Darling, F. F., 17317.
Darling, R. C., 18602.
Dasco, M. M., 17886.
Da Silva, F. A. G., 18693.
Dassat, P., 18569.
Dauer, C. C., 16299.
Daukas, C. G., 15874.
Daumézon, M. G., 16363.
Dauncey, M., 17468.
Davey, B. L., 17478.
Davidoff, E., 17182, 17910.
Davidson, G., 15757.
Davies, D. M., 15758.
Davies, T. A. L., 18032.
Davis, G. W., 16528.
Davis, J. A., 18375.
Davis, L. R., 18056.
Davison, S., 17027.
Dawson, A. R., 17353.
de A. Leitão, E., 16009.
De Almeida, H. R., 17302.
de A. Moraes, N. L., 18921.
De Andrade, L., 18146.
De Auster, M. J., 18754.
Debakey, M. E., 17520, 18335.
De Bernard, B., 17503.
De Bettencourt, J. M., 18376.
De Bois, H. J., 17521.
Debrunner, H., 16975.
De Carolis, D., 17606.
De Carvalho, A., 18570.
Dechaume, J., 18703.
De Coek, N., 17751.
DeCosse, J. J., 18890.
de Finetti, B., 15765.
Deforest, G. K., 16143.
De Froe, A., 16048.
Degárd, O., 17937.
De Gironcoli, F., 17855.
De Góes, P., 18146.
De Groot, A. L., 17354.
Dehne, E., 18519.
Deisting, W., 17090.
de Jager, J., 16637.
De Juan Martín, M., 15976, 15977, 18438.
Delagi, E. F., 18120.
deLalla, O., 15861.
Delaney, M. M., 18097.
Delargy, J., 18076.
de la Rosée Graf, B., 18642.
Delattre, R., 16152.
Delaunay, A., 15882, 16300.
Delaville, M., 18706.
Del Bo. M., 18704.
Delgado Febres, E., 16708.
Delgado-Fourzan, E., 17939.
de Longeville, H., 18199.
Delore, P., 16342, 17970.
De Maar, E. W., 17607.
De Maio, D., 15845.
Démange, E., 18486.
De Marcillat, C., 17327.
De Martiis, M., 15883.
Demers, R., 16158.
Demming, J. A., 16364.
Deneffe, P. J., 18943.
Denmark. Statistiske Department, 15796.
Dennis, W., 18897, 18898.
Denny, G. H., Jr., 18303.
Denoix, P. F., 18571.
Den Oudsten, S. A., 17748.
Densen, P. M., 19003.
De Palma, C., 16747.
De Rosa, G., 15740.
Desal, R. N., 16079.
Deschauer, A., 16862.
De Sèze, S., 17719.
Desjacques, R., 18439.
Deslous, P., 18735.
Desmond, T. C., 16567, 16593, 17328, 17355, 19083.
Desowitz, R. S., 16622.
Destrem, H., 18811.
De Takats, G., 17608, 18498.
Detmer, L., 17545.
Deutschberger, O., 18338.
De Vecchis, C. E., 18440.
de Vergottini, M., 16424.
De Vido, G., 18643.
Devine, K. D., 18631.
Devitt, F. B., 16259.
De Vore, M., 18149.
Dewar, H. A., 16757.
Dewdney, J. C., 17217.
Dewees, M., 17161.
Diamond, J., 18077.
Dickerson, W. H., 16425.
Dickman, M., 17720.
Diederich, C., 18985.
Dietrich, C., 18062.
Dietrich, T. S., 16392.
Díez, E. D., 16730.
Diez, J., 16730.
Di Giorgio, A. M., 16786.
Di Guglielmo, G., 15849.
Dijon, H., 17329.
Dilks, E., 17656.
Di Maggio, G., 16198.
Di Nardo, U., 16049.
Dingle, J. H., 18525.
Dingle, J. T., 16162.
Dinken, H., 18812.
Division of Welfare Agencies. Board of Pensions. Presbyterian Church in the United States of America, 16471.
Divry, F., 18487.
Dixon, A. S., 18717.
Djorup, F., 16963.
Djourichitch, M., 18530.
Doberauer, W., 15978.
Dobriner, K., 15948.
Dobson, D. P., 17635.
Dock, W., 18377.
Doenges, J. L., 19024.
Doernbach, E. M., 16787.
Dogan, S., 16010.
Dogliotti, M., 16836, 17590.
Dohan, F. C., 17060.
Dolaz, E. J., 18780.
Dolehide, R. A., 18780.
Dolfini, G., 16724.
Dominican Republic. Dirección General de Estadística, 16393.
Donahue, W., 16426, 16462, 17303, 17971.
Donio, D. A., 18747.
Donnelly, M. M., 15766.
Donnes, V., 16731.
Donomae, I., 18378.
Donovan, J. C., 16788.
Doppelt, J. E., 16365, 17972.
Dordick, J. R., 16171, 18716.
Dorfman, R. I., 15962.
Dormer, A. E., 16933.
Dorn, H. F., 16638, 17153, 17911, 17912.
Dorpat, T. E., 18179.
Dorsey, J. M., 16244.

Doublet, J., 16512.
Douglas, K. R., 17679.
Douglas, M., 18969.
Dowdell, W., 17919.
Doyle, F. J., 17116.
Doyle, J. T., 18238.
Doyle, L. P., 17013.
Dozier, W. A., Jr., 15751.
Dozoretz, L., 17360.
Drake, V. C., 15741.
Drance, S. M., 17703.
Dresner, E., 18749.
Dreyer, K., 17459.
Dreyer, V., 16172.
Drezner, H. L., 18747.
Drill, V. A., 18256.
Driver, M. F., 18114.
Drolet, C., 16876.
Droller, H., 16209.
Duchêne, H., 19019.
Dudkowa, M., 18989.
Duff, G. L., 17522.
Duff, I. F., 16156.
Dufrenoy, J., 15841.
Dufrenoy, M. L., 15841.
Dunaevskii, L. I., 18781.
Dunham, H. W., 18078.
Dunham, R. E., 18917.
Dunn, H. J., 17913.
Dunn, J., Jr., 17609.
Dunn, J. E., Jr., 17914.
Dunn, M. B., 17985.
Dunsmore, R., 17793.
Dupré, —., 17082.
Durand-Fardel, Ch., 19067.
Duran-Reynals, F., 18531, 18534.
Durbin, E., 17546.
Dutchess, C. E., 16447.
Duthie, J. J., 16157, 16158, 16173, 17749, 18717.
Dutton, W. S., 18150.
Dyck, P., 16732.
Dyrbye, M., 16733, 17472, 18347.

E

Earle, W. R., 18765.
Eaton, J. M., 17730.
Eaton, J. W., 18572.
Ebaugh, F. G., 18092.
Eckerström, S., 18813.
Eckstein, P., 16080.
Ecuador. Dirección General de Estadística y Censos, 17218.
Eddy, V. M., 16725.
Eder, A., 17973.
Edholm, O. G., 16690.
Edler, K. F., 16529.
Edlund, T., 17721.
Edwards, G. C., 16939.
Edwards, W. C., 17731.
Egelius, N., 16145, 17824.
Egemose, T., 16187.
Eggleston, F., 17375.
Ehmke, D. A., 17478.
Ehrenberg, R., 16301.
Ehring, F., 16210.
Ehrlich, I., 16262.
Eiber, H. B., 18338, 18872.
Eiseman, P. C., Jr., 18336.
Eisenbeis, C. H., Jr., 16179.
Eisert, O., 18121.
El-Badry, M. A., 15767.
El-Gindy, M. S., 16623.
Elias Costa, J. D., 17670.
Elinson, J., 18866.
Elkins, H. B., 16233.
Elliott, A., 16011.
Elliott, C. K., 17270.
Elliott, R., 16594.
Ellison, J., 17474, 17475.
Elmadjian, F., 15946.
Elman, R., 17356.
Elmlinger, P. J., 17539.
El Salvador. Dirección General de Estadística y Censos, 18006.
Elvehjem, C. A., 17480.
Emerson, K., Jr., 18782.
Emerson, P. A., 18718.
Emge, L. A., 15938.
Emmet, E. C., 16568.
Emmett, R., 17762.
Endo, J., 18644.
Engle, E. T., 15939, 16789.
Engelberg, H., 17547, 18379.
England. Leeds (A) Group and Leeds (Group B) Hospital Management Committee, 17887.
Engle, E. T., 18180.
Enjalbert, J. M., 16871.
Enomoto, T., 18603.
Enterline, P. E., 16273.
Eppright, E. S., 15823.
Epps, R. G., 17680.
Epstein, L. A., 17244, 18944, 18945, 18951.
Epstein, W., 17750.
Eränkö, O., 16120.
Erlande, G., 18413.
Erlandsson, S., 17117.
Ernst, S., 16102.
Ernsting, W., 16012.
Escalante Roldán, A., 16097.
Escarpenter-Oriol, J., 17795.
Escobar, A., 16877.
Eskridge, J. B., III., 16801.
Espejo, E., 15805.
Esteves, J., 16211.
Eston-Smith, A. N., 17600.
Ettinger, H., 16543.
Evans, T. C., 16233.
Evans, V. J., 18765.
Exton-Smith, A. N., 16263.
Eyles, D. E., 18539.
Eyre-Brook, A. L., 17050.

F

Fabrino, A. De O., 18741.
Faidherbe, P., 16199.
Failing, J. H., 16050.
Fairbairn, H., 16622.
Fairman, C., 18970.
Falaschini, A., 17501.
Faldi, S., 17518.
Falk, G., 16000.
Falkland Islands. Colony (excluding the Dependencies), 16394.
Fallis, L. S., 18278.
Fankhauser, R., 16863.
Fantauzzi, A., 15756.
Fantini, S., 18331.
Farber, S. M., 18604.
Farley, D. M., 17662.
Farman, C. H., 19025.
Farrar, M. S., 18093.
Farris, S., 18814.
Farrow, I. J., 16150.
Fattovich, G., 16864.
Fauconnier, —., 16994.
Fauri, F. F., 18098.
Favilli, G., 17834.
Fazekas, J. F., 16865, 17613.
Fearnley, G. R. 16983, 17751.
Feder, W., 16773.
Federici, N., 15752.
Fedorov, V. K., 18899.
Feifel, H., 16366, 18900.
Feig, M., 18532.
Feigenbaum, A., 17915.
Fein, S., 17357.
Feinberg, A. W., 18350.
Feinblatt, H. M., 16853.
Feldman, M., 15940, 15979.
Felix, R. H., 16569.
Fell, S. C., 17078.
Feller, A. E., 18525.
Fellinger, K., 17852.
Fels, J., 18841.
Fels, S. S., 17597.
Fénelon, F., 16866.
Feniak, E., 18281.
Ferderber, M. G., 15824.
Ferguson, J. T., 18842.
Fernández-Ruiz, C., 18414.
Fernoux, H., 16923.
Ferrando, H. A., 16730.
Ferraris, F., 15941, 17744, 17813.
Ferrero, S., 17028.
Ferulano, O., 17091.
Feudell, P., 16867.
Fiandaca, S., 16051.
Ficarra, B. J., 17567.
Ficinus, M., 19068.
Fidanza, F., 15866.
Fields, A., 16013.
Filskov, A., 16790.
Fink, M. A., 18533.
Finkle, A. L., 16230.
Finkler, R. S., 16791.
Finland. Tilastollinen Päätoimisto, 15797.
Finocchiaro, S., 17592.
Finzi, M., 15825.
Finzi, N. S., 17722.
Fiolle, J., 17318.
Fiore, M., 17154.
Fiorio, G., 15915, 16758.
Fischbach, M. W., 17499.
Fischer, F., 17029, 17034.
Fischer, K., 16868.
Fischer, R. E., 17704.
Fish, F., 17368.
Fishbein, M., 16990.
Fisher, A. J., 16384.
Fisher, C. M., 17610.
Fisher, M. B., 16104, 16110.
Fishman, A. P., 17681.
Fitz, F. W., 18380.
Fitzelle, G. T., 17196.
Fitzgibbon, W. C., 16614.
Fleetwood, J. F., 17397.
Fleisch, A., 18257.
Fleishman, W., 17568.
Fleming, T. C., 16014, 17245.
Fletcher, E., 17752.
Fletcher, J. G., 16690.
Fletcher, W. B., 16173.
Flint, J. S., 18527.
Flocks, R. H., 16233, 17092, 17856.
Florida. Department of Public Welfare. Division of Research and Statistics, 18922.
Foà, C., 15722.
Förster, O., 17723.
Foley, W. T., 15875, 17183, 17376, 17627.
Folger, J. K., 15754.
Fomon, S., 17079.
Fongi, E. G., 18885.
Fonseca, A. DA., 16211.
Forcher-Mayr, O., 16052.
Ford, L. T., 17724.
Ford, N. D., 16427.
Ford, T. R., 15754.
Forde, L. E., 16448.
Foret, J., 17857.
Forman, C. H., 16513.
Forsgren, E., 17916.
Forster, W., 16302, 17917.
Foster, F. R., 17125.
Fourrier, A., 17774.
Fowler, W. S., 18605.
Fraenkel, G. J., 18441.
Fraenkel, M., 17888.
Fragermayer, —., 16980.
Frakes, M., 17285, 17319, 17377.
France. Haut Comité Consultatif de la Population et de la Famille. Présidence du Conseil, 18007.
France. Institut National d'Hygiène, 18215.
France. Institut National de la Statistique et des Etudes Economiques, 16395, 17640, 18008, 18923.
France. Ministere du Travail et de la Securite Sociale, 19026.
Francescon, M., 15942.
Francillon, J., 17957.
Francis, N. G., 18079.
Franco, S. C., 16264.
Francois, J., 18645.
Françon, F., 16199, 17064, 18719.
Françon, J., 16199, 18719.
Frank, L. K., 17398.
Frank, R. M., 17479.
Frank, S., 19084.
Franke, W. H., 18033.
Frankland, H. M., 17424.
Franks, L. M., 16225, 16226.
Franksson, C., 16219, 16220.
Fraser, I., 16734.
Frauenfelder, W., 18241.
Frederik, W. S., 18738.
Freeland, R. O., 15742.
Freeman, H., 15962.
Freeman, J. T., 15808, 17835.
Freeman, T., 18840.
Fregly, M. J., 16711, 16735.
Freire, D. A., 16155.
Freire, P. M., 18531, 18534.
Freis, E. D., 15884.
Fremming, B. D., 16624.
Fremont-Smith, P., 16174.
French, R. B., 15818.
French, W. F., 19085.
French West Africa. Haut Commissariat, 16396.
Freytag, B., 16060.
Frick, A., 15743.
Freundlich, H. F., 16998.
Freyberg, R. H., 17030.
Freydberg, V., 16829.
Friedfeld, L., 17889.
Friedland, F., 16175.
Friedlander, H. S., 16792.
Friedman, C. L., 18474.
Friedman, I. A., 18780.
Friedman, S. M., 18474.
Friedmann, M., 17102.
Froimovich, J., 17399.
Frost, L. L., 16362.
Frucht, A. H., 16053.
Fryer, J. H., 17502.
Fugiwara, S., 18181.
Fujibayashi, Y., 18646.
Fujii, S., 18647.
Fujioka, Y., 18606.
Fujiwara, T., 18843.
Fukai, S., 18405.
Fukazawa, H., 18190.
Fukui, T., 18953.
Fukutake, T., 18648, 18649, 18650.
Fukutome, Y., 18381.
Fulkerson, S. C., 17966.
Fuller, C. S., 17304.
Fullerton, H. W., 16759.
Funder, W., 16105.
Funderburk, W. H., 18842.
Furuya, M., 18651.
Fustinoni, O., 15728, 17155.
Futcher, P. H., 17469.

G

Gaca, A., 18787.
Gaensler, E. A., 16098.
Gaffuri, E., 16092.
Gage, M., 18337.
Gagliardo, D., 16449.
Gaglio, M., 17516, 17753.

Gaida, A., 16947.
Gaillard, P. J., 16610.
Galante, E., 18754.
Galdston, M., 17682.
Galet, C., 17489.
Gallagher, J. J., 16530.
Gallagher, T. F., 15948, 15949.
Galli, T., 17754.
Galliadi, G., 18099.
Gamalero, P. C., 18634.
Gambassi, G., 15885.
Gamp, A., 16991, 16992, 16993, 18720.
Ganahuati, S. M., 16848.
Gandler, A. L., 16176.
Gandolfi, M., 16090.
Ganem, E. J., 17858.
Garagnani, A., 15919.
Garbone, R., 17963.
Garbus, J., 16074.
García-Castrillo Sánchez, L., 18871.
García Cruz, M., 17330.
García Moreno, E., 15850.
Garello, L., 15916.
Garfinkle, S., 17251.
Garland, H., 16015.
Garlick, W. B., 17867.
Garn, S. M., 17636.
Garneau, R., 16324.
Garreto, E., 17772.
Gasparini, F., 16081.
Gaspero, H. DI., 17876.
Gass, R. S., 17693.
Gastaldi, A., 16793.
Gaucher, M., 16200.
Gautier, E., 16844.
Gautier, R., 16844.
Gauwerky, F., 16916.
Gazzarrini, A., 17503.
Gedde-Dahl, T., 16595.
Geddes, E. W., 18954.
Geill, T., 18813.
Geiringer, E., 16794.
Geleta, J. N., 18715.
Gemolotto, G., 16106.
Gendel, B. R., 15943.
Genest, L., 17957.
George, H. E., 16531.
Gerauer, A., 16760.
Gerber, S., 16130.
Gerig, D. S., 18052.
Gerke, P. IA., 17663.
Gerking, S. D., 15809.
Gerl, A. J., 16264.
Gerli, M., 15944.
Germany. Federal Republic. Bundesanstalt für Arbeitsvermittlung und Arbeitslosenversicherung, 18034.
Germany. Federal Republic. Bundesministerium für Gesamtdeutsche Fragen, 16397.
Germany. Federal Republic. Statistisches Amt, 18924.
Germany. Federal Republic. Statistisches Bundesamt, 16398, 18925, 18926.
Germany. Federal Republic. Statistisches Landesamt, 16673.
Germuth, F. G., Jr., 16055.
Gershon-Cohen, J., 16976, 17597.
Geschwender, D., 17474, 17475.
Gest, —., 17292.
Ghinozzi, G. P., 18310.
Giamporcaro, C., 16639.
Gianoli, A., 18607.
Giarola, A., 16779.
Gibbens, J., 15826.
Gibbons, C. C., 16436.
Gibbs, E. L., 16869.
Gibbs, F. A., 16869.
Gibree, N. R., 15946.
Gibson, J. R., 17642.
Gibson, K. B., 16265.
Gilbert, J., 18317.
Giletti, B. J., 16561.
Gillet, —., 16980.
Gillhespy, R. O., 16870.
Gilliam, A. G., 15768.
Gilmore, H. R., Jr., 17755.
Gilpin, W. A., 17796.
Gilston, R. J., 18752.
Ginzberg, R., 16054, 16303, 18844.
Giocoli, G., 16795.
Girardeau, M., 16822.
Gitlitz, I., 18216, 18217.
Gitman, L., 16266, 17118.
Glass, J., 18282.
Glass, S. J., 18783.
Glasser, M., 17940.
Glazier, F., 15861.
Glenn, F., 16348, 16850.
Glorig, A., Jr., 17706.
Gluck, E. J., 16171.
Gnocchi, O., 16026.
Gobbato, F., 15886, 15912.
Gobert, J., 18721.
Goddard, H. M., 17498.
Godellas, V., 16848.
Godlewski, Z., 17031.
Göhle, O., 16145.
Goethe, N., 16491.
Gofman, J. W., 15861, 15917, 15918, 17539.
Gogokhiia, Sh. D., 16661.
Gold, H., 16065.
Goldberg, A., 16516, 1[illegible]036, 19037.
Goldberg, R., 17252.
Gol'Dberg, V. V., 18784.
Goldbloom, A. A., 15980, 15981, 18338, 18872.
Goldenberg, I. S., 15982.
Goldfarb, A. I., 16304, 17918.
Goldfeld, F. B., 17889.
Golding J. R., 17799.
Goldman, R., 15891.
Goldman, R. P., 19086.
Goldmann, F., 16267.
Goldsmith, G. A., 15826.
Goldstein, M. S., 17732.
Goldwater, L. J., 17546.
Gomez, M. S., 17795.
Gonzalo, P. G., 15723.
Good, M. G., 17756.
Goodbody, M. F., Jr., 15862.
Gooddy, W., 16305.
Goodman, A., 18122.
Goodman, J. I., 16761, 17919.
Goodwin, R. A., Jr., 16093.
Goodwin, W. E., 17862.
Gordon, A. S., 18193.
Gordon, B., 16094, 17378.
Gordon, G. S., 18488.
Gordon, J. McL., 18560.
Gordon, R. G., 16532.
Gorman, T., 16533.
Gospodinoff, A., 17020.
Goto, T., 18632, 18785.
Gough, J., 16146.
Gourevitch, M., 17414.
Graber, I. G., 17106.
Graber-Duvernay, Jr., 16994.
Grad, B., 16796.
Graham, J. G., 18339.
Graham, K. M., 17065.
Graham, W., 17065.
Gram, M. R., 18262, 18263.
Gramm, E. R., 16256.
Grant, I. D., 17126.
Graphic Chart Service, 15769.
Grappe, J. M., 18722.
Grasse, L. A., 17790.
Grasso, G., 17631.
Grasset, A., 16321.
Graveleau, J., 15894.
Grawitz, P., 19081.
Grayheck, J. T., 16227.
Graziosi, G., 17127.
Great Britain. Committee on the Economic and Financial Problems of the Provision for Old Age, 18026
Great Britain. General Register Office. England and Wales, 17219.
Great Britain. General Registry Office of Births. Scotland, 15798, 16399.
Great Britain. Parliament, 16411.
Great Britain. Royal Statistical Society, 17220.
Great Britain. Treasury, 15799.
Greech, O., Jr., 17520.
Green, L. E., 17425.
Greene, L. B., 18128.
Greene, L. F., 17093.
Greenleigh, L. F., 17974.
Greenstein, L., 16858.
Gregoretti, L., 16306.
Gregory, D. C., 16911.
Greiner, T., 16065.
Greither, A., 16736.
Greville, T. N. E., 17331, 17461.
Gribetz, H. J., 18749.
Griffith, G. G., 17535.
Grischener, E., 18723.
Gros, C., 16871.
Gros, H., 16992, 16993.
Grosch, D. S., 18561.
Gross, J., 16212.
Gross, R., 17823.
Gross-Albenhausen, F., 16964.
Grossman, B. L., 18151.
Grossman, H. J., 17187.
Grote, L. R., 16343, 16698.
Grotjahn, M., 17920.
Grott, J. W., 16797, 17504.
Grüner, A., 17505.
Gruesser, F., 17425.
Gruman, G. J., 19069.
Grunwald, H., 17797.
Gualco, S., 16798.
Gualdi, A., 15919.
Gualtierotti, F., 15735.
Gubersky, B., 17357.
Gueniot, M., 17324.
Gürakar, M., 18563.
Guffanti, A., 17593, 17958, 17959.
Guidi, G., 16160, 17517, 17606.
Guilhem, A., 18429.
Guillaume, P., 17112.
Guinet, P., 16799.
Guiraud, P., 17143.
Guldberg-Herdis Lund, E., 16800.
Gullingsrud, M. J., 16301.
Gumbel, E. J., 16640, 18147.
Gumpert, M., 16570.
Gunella, G., 17689.
Gunlaugson, F. G., 16641.
Gunn, S. A., 16228.
Gurvitz, M. S., 17975.
Guttmacher, A. F., 18573.
Guyétant, S., 19070.
Gylfe, J. S., 15859.
Guyon, L., 18535.

H

Haar, H., 15955.
Haber, J., 16307.
Hadley, H. L., 17850.
Hadley, J. N., 15770.
Hadorn, H., 16625.
Hadra, E. G., 15980, 15981.
Häkkinen, S., 17206.
Hageman, R. H., 17415.
Hagerman, D. D., 18303.
Hahimoto, K., 18200.
Haibach, A., 17611.
Halhuber, M. J., 17032.
Hall, D. A., 15930, 17562.
Hamilton, C. H., 19071.
Hamilton, D. M., 17938.
Hamilton, J. B., 16213, 18415.
Hammond, F. M., Jr., 17094.
Hammond, W., 17921.
Hamrin, G., 16472.
Hamtoft, H., 17459.
Hanamura, Y., 18536.
Hanan, R., 16055.
Handfield, G. Y., 17033.
Hanfmann, E., 17922.
Hanna, F. A., 17253.
Hannah, A., 16695.
Hansen, K. B., 17034.
Hansen, R. A., 18527.
Hanson, H., 17379.
Happey, F., 16968.
Harada, A., 18295.
Harada, T., 18652, 18653.
Harada, Y., 18611, 18654.
Harasawa, M., 16095, 16096.
Harbaugh, R., 16032.
Harman, D., 18298.
Harmison, C. R., 15877.
Harper, A. E., 17480.
Harpuder, K., 15887.
Harris, A., 16308.
Harris, A. J., 17738.
Harris, M. D., 16624.
Harris, M. H., 17923.
Harris, R., 17358, 17523, 17798, 18382.
Harris, R. G., 18786.
Harrison, J. H., 18420.
Hart, F. D., 16940, 17799.
Hart, G. H., 15755.
Hart, J. W., 17293.
Hartfall, S. J., 17825.
Hartung, E. F., 16131.
Hartung, E. G., 17757.
Hartung, J., 17080.
Haschek, H., 17095.
Hasche-Klünder, R., 18787.
Hasegawa, H., 18446.
Hasegawa, Y., 18697.
Hashimoto, K., 18242.
Hasigawa, H., 18447.
Hatakeyama, M., 18655.
Haugen, F. P., 17635.
Haus, E., 17032.
Hauser, F., 17305.
Hausser, E., 15983.
Havener, W. H., 17705.
Havighurst, R. J., 16367, 16428.
Havkins, W., 18311.
Haw, R. H., 16642.
Hawkins, C. E., 18946.
Hawkins, W. W., 17496, 17507.
Hayakawa, M., 18617.
Hayashi, E., 18577.
Hayashi, I., 18446, 18447.
Hayashi, K., 18518.
Hayashi, M., 18574, 18575.
Hayashi, T., 18423.
Haydak, M. H., 17426.
Hayes, B. A., 17096.
Hayes, O. B., 17733.
Heaf, F. R., 17683.
Hecht, M. B., 16897.
Heck, V. M., 16911.
Hedges, R. N., Jr., 18375.
Hedqvist, T., 18845.
Heend, S., 15827.
Heglin, H. J., 18901.
Heider, C. F., 16815.
Heinen, W., 16762.
Heinicke, H. R., 17480.
Heinzen, B., 16901.
Held, J. P., 16872.
Hélie, J., 16135.
Hellbaum, A. A., 16801.
Heller, B. I., 18383.
Heller, C. G., 17569.

Heller, M. L., 16056.
Hellner, H., 16995.
Helmke, R., 16626.
Helmle, M., 17952.
Hemingway, A., 17470.
Hench, P. S., 17058.
Henderson, A. L., 17917.
Henderson, E., 16763, 17800.
Henderson, L., 16302.
Henripin, J., 18927.
Henry, K. M., 15810.
Henry, L., 17221.
Henschen, F., 17877.
Heppner, G. J., 16132.
Herbette, F., 18035.
Herbeuval, R., 18340.
Hernández Giménez, J., 16097.
Herrmann, U., 17570.
Herzberg, J. J., 16133.
Hess, E., 17859.
Hesse, F., 15945.
Hestad, H. E., 18823.
Hevelke, G., 16717, 16737, 16738, 18341, 18365.
Heyman, J., 17758.
Hibi, S., 18342.
Higginson, J., 17508.
Higgons, R. A., 15819.
Hilburg, L. E., 16143.
Hildin, K., 17505.
Hildin, T., 17505.
Hilger, J. A., 17706.
Hilke, H., 17320.
Hill, D., 16309.
Hill, E. H., 16273.
Hill, J., 18873.
Hill, P. S., 16166.
Hilleboe, H. E., 17119, 18238.
Hilliard, M., 16802, 16803.
Hills, L. R., 17254.
Hilton, J. G., 15862.
Himwich, H. E., 18258, 18489.
Himwich, W. A., 18258.
Hines, B. E., 18312.
Hinke, D. H., 17731.
Hinke, J. A. M., 18474.
Hinman, F., Jr., 16229.
Hirano, S., 18902.
Hirata, M., 18576.
Hirata, Sh., 18656.
Hirato, Y., 18354.
Hirosawa, K., 18357, 18358, 18359, 18360, 18361, 18391.
Hirsch, S., 17400.
Hirschhorn, K., 18545.
Hitchcock, D. J., 16627.
Hitoshi, M., 18537.
Hitt, H. L., 18014.
Hiwatari, Sh., 18657.
Hjorth, N., 16172.
Hněvkovsky, O., 16696.
Hoagland, H., 15946.
Hobbs, G. E., 17176.
Hobson, W., 16310, 16368, 17890.
Hochrein, M., 17637, 18384.
Hocking, W. S., 16674.
Hodges, P. C., 17891.
Hodges, R. G., 18525.
Hoesch, K., 17801.
Hoffman, M. M., 16796.
Hoffman, O., 17580.
Hoffman, R. A., 17667.
Hoffman, S., 18955.
Hoffmann, V., 17960.
Hohman, H. F., 16514.
Holland, R. W., 16953.
Hollander, J. L., 17060.
Hollender, A. R., 17707.
Hollender, M. H., 19045.
Hollenweger-Meyer, B., 16804.
Hollingsworth, D. F., 15820.
Hollister, L. E., 17156.
Holmer, A. J., 16805.
Holmes, E. M., Jr., 16268.
Holopainen, T. E., 17804.
Holst, J. E., 16187.
Holt, E. K., 17157.
Homburger, F., 17892.
Honan, B., 17929.
Hoogendoorn, D., 16643.
Hope, M., 17380.
Hopkins, B., 16874, 17924.
Hoppe, D., 17826.
Horácek, J., 18343.
Horike, M., 18344.
Hornsby, A. T., 17078.
Horonick, A., 17500.
Horoschak, S., 18747.
Horrax, G., 16016.
Horstmann, D. M., 16311.
Horstmann, K., 17255.
Horton, C. E., 17078.
Horvath, S. M., 15748, 17538.
Horvitz, D. G., 19003.
Hosmer, C. L., 18053.
Hotchkiss, R. S., 17097.
Houck, G. H., 18069.
Hougen, A., 16912.
Howard, D. H., 16295.
Howell, T. H., 15920, 16385, 16852, 17925.
Howland, A. O., 18850.
Hoyt, G. C., 16450.
Hoyt, W. F., 17588.
Huang, T. C., 18332.
Huddleston, O. L., 18123.
Hudson, P. B., 16230, 17860.
Hughes, W., 15828, 16873, 17524.
Hujimori, M., 18538.
Hujiwara, I.: 18611.
Hukuda, T., 18886.
Hukuhara, T., 18537.
Hukui, M., 18329.
Hult, L., 18694.
Humphrey, H. H., 19027.
Humphries, M., 17976.
Hungary. Központi Statisztikai Hivatal, 16400.
Hunter, W., 15724.
Hunziker, H., 17759.
Hurff, G. B., 17271.
Hursh, J. B., 16058, 17638.
Hurtado, A., 16708.
Hurwitz, D., 18416.
Hurwitz, I. M., 17128.
Hussel, W., 16177.
Hustin, A., 16764.
Hutchinson, B., 16492.
Hutchinson, G., 16515, 19036, 19037.
Hutt, B. K., 15748, 17538.
Hwang, W., 16001.
Hyatt, G. W., 18765.

I

Iason A. H., 17594.
Ibañez Muñoz, D., 16007.
Ibarra, J. D., Jr., 17734.
Ibberson, J. R., 16347.
Iida T., 18373
Iijima, Y., 18385, 18386.
Ikeda, M., 18345, 18357, 18358, 18359, 18360, 18361.
Ikegawa K., 19009.
Ikkos, D., 15863.
Illinois. State Department of Public Health. Bureau of Statistics, 18928.
Imao, K., 18606.
Imbriano, A. E., 16888.
Imming, W., 16017.
Inada, Y., 18480.
Inama, K., 17032, 17760.
India. Registrar General, 17222, 17223.
Indiana State Commission on the Aging and Aged, 18080.
Indovina, I., 15864.
Ingegnieros, S., 15725.
Inger, H., 16806.
Ingle, D. J., 18209.
Innocenti, E., 15867, 17511.
Innocenti, S., 17332.
Inoue, Sy., 18846.
Institute of Actuaries, 16644.
International Labour Office, 16429, 18036.
International Social Security Association, 17333.
Inza, R., 16085.
Iob, V., 15815.
Iraq. Ministry of Economics. Principal Bureau of Statistics, 16401.
Ireland. Central Statistics Office, 17224, 18009.
Isa, J. M., 17429.
Isemein, L., 16996.
Isotupa, R., 16742.
Isaacs, B. L., 18304.
Ishida J., 18608.
Ishihara, K., 18609, 18610, 18611, 18613, 18614.
Ishii, T., 18313.
Italy. Documentation Centre, 17225, 18037.
Ito, I., 18697.
Ito, Ry., 18442.
Ito, Y., 18633.
Iwano, J. H., 17861.
Iwanowska, A., 16997.
Iwatsuru, Ry., 18802.
Iwazaki, T., 18615.
Izaki, M., 18755, 18756.
Izar, G., 16201, 16202.
Izui, M., 18305.

J

Jackson, E. B., 16998.
Jackson, W. P., 17735.
Jacob, W., 17158.
Jacobelli, A., 15879.
Jacobs J. H., 17752.
Jacobs, W. M., 17565.
Jacquot, R., 17489.
Järvinen, K. A. J., 18724.
Jaffe, H. L., 16768, 17104.
Jahn, H. J., 18737.
Jalavisto, E., 16699.
James, G., 16269.
Janousková, K., 16107.
Jansen, J. H. C., 17321.
Jansen, M. T., 17471.
Jansson, H, 17080.
Japa, J., 17571.
Japan. Bureau of Statistics, 18929, 18930.
Japan. Department of Public Health Statistics. Ministry of Health and Welfare, 18243.
Japan. Division of Health and Welfare Statistics. Welfare Minister's Secretariat, 18244.
Japan. Ministry of Welfare. Division of Health and Welfare Statistics, 15800.
Jaschke, W., 16807.
Jean, A., 16596.
Jecklin, H., 16645.
Jefferson, D. M., 17496.
Jeffrey, M. R., 16998, 18717.
Jeffreys, R. J., 16560.
Jehl, J. O., 16077.
Jelnes, K., 16952.
Jensen, W. N., 17492.
Jepson, R. P., 17791.
Jervis, G. A., 17903, 17926.
Jese, L., 18658.
Jessel, E., 16017.
Jessiman, A. G., 18782.
Jewish Home for Aged, 18124.
Jodin, R., 19028.
Johnsen, S. G., 17572, 17573.
Johnson, A., 17750.
Johnson, C. E., 18408.
Johnson, C. H., 16032.
Johnson, E. A., 17664.
Johnson, G. E., 18054.
Johnson, H. J., 18971.
Johnson, L., 16825.
Johnson, M. A., 16231.
Johnson, N., 17474, 17475, 18262.
Johnson R. M., 16235.
Johnston, F. A., 16683, 17479.
Johnston, J. P., 16121.
Johnston, P. M., 15851.
Jolliffe, N., 16898.
Jones, C. F., 18931.
Jones, C. P., 18764.
Jones, F. A., 16899.
Jones, F. E., 18539.
Jones, H. B., 17437, 17539, 18191, 18218.
Jones, H. E., 16369, 17977.
Jones, H. H., Jr., 17612.
Jones, I. J., 18132.
Jones, R. F., 16232.
Jonsson, E., 16145, 17802.
Jordan, E. P., 16344.
Jordan, H., 16765.
Jordan, W. S., Jr., 18525.
Josephson, B., 15865.
Josiah Macy, Jr. Foundation, 15726.
Josserand, A., 17525.
Jost, H. M., 16230.
Jud, H., 16999.
Juhl, S., 15947.
Juhlin, L., 17721.
Julia, J. F., 16967.
Jungkunz, R., 16625.
Jurgens, G., 17674.
Justics, W. A., 17981.
Justin-Besançon, L., 16147.
Justiss, W. A., 16108.

K

Kabranova, L. A., 15872.
Kadyroza, K. K., 18659.
Kaeding, A., 16956.
Källqvist, I., 17684, 17685.
Kahle, R., 15921.
Kahn, R. L., 17644.
Kai, T., 18443.
Kaindl, F., 17761.
Kaiser, H. E., 16597.
Kai-Shek, C., 18081.
Kakizaki, Ts., 18798.
Kalinowski, K., 16691, 17129.
Kalliomäki, L., 17000, 18725.
Kallmann, F. J., 17422.
Kameoka, K., 15989.
Kamijo, K., 18444.
Kanaar, A. C., 18125.
Kanagawa, M., 18577.
Kanai, K., 18346.
Kaneko, U., 18757.
Kano, M., 18475.
Kano, Y., 18758.
Kansas. Legislative Council. Research Department, 17306.
Kansas. State Department of Social Welfare, 18063.
Kaplan, J., 16534, 16535.
Kaplan, L. I., 17624.
Kaplan, O. J., 17977, 17978.
Kappas, A., 15948, 15949.
Karafin, L., 17863.
Karel, J. L., 18314.
Karl, R. C., 16348.
Karoly, B., 15984.
Karsh, M. L., 16077.
Karsten, A., 16493.
Karvonen, M. J., 16059.
Kasanen, A., 17000.
Katagiri, Sh., 18632, 18633.

Kato, M., 18283, 18387, 18540.
Katsujl, H., 18517.
Katz, L. N., 17526.
Katzberg, A., 16214.
Katzman, B., 17574, 18417.
Kaufman, J. G., 16536.
Kaufman, J. J., 17862.
Kaufman, W., 16692.
Kaufmann, F., 16646.
Kaufmann, R., 16122.
Kauhanen, E., 16742.
Kawabe, Y., 18455.
Kawahira, Y., 18578.
Kawamata, Y., 18445.
Kawase, S., 18660.
Kawiak, J., 15739.
Kay, D. W., 16874, 17159.
Kay, H., 17979, 17980.
Kaylor, W. M., 17110.
Kearns, J. E., 17544.
Kearns, J. W., 16227.
Keating, F. R., Jr., 15970.
Keay, A. J., 18880.
Keck, E., 17160.
Keech, M. K., 15930, 16215, 17562.
Kehrer, H. E., 16875.
Keil, E., 16598.
Kelemen, G., 17708.
Keller, P., 15842.
Kelley, B., 18490.
Kellgren, J. H., 17791.
Kelly, A. O. J., 18491.
Kelly, E. L., 17197.
Kelly, G. L., 16917.
Kelly, J. J., Jr., 16767.
Kelly, M., 17035, 17803.
Kemp, W. H., 19029.
Kendrick, B. B., 17294, 17295.
Kennedy, B. J., 18579.
Kennedy, C., 18492.
Kent, A. P., 17198.
Kentucky. University of. Kentucky Agricultural Experiment Station, 18972.
Keohane, K. W., 16706.
Kerdman, R. Ia., 18661.
Kernohan, J. W., 17609.
Kerr, H. D., 16233.
Kerr, K. B., 16900.
Kessler, H. E., 15985.
Kety, S. S., 18493, 18494.
Keutzer, A., 16647, 16648, 18616.
Keys, A., 15866, 15888, 15898, 17509, 17527, 17543, 17548, 18399, 18541.
Keys, M. H., 15866.
Kheim, T., 15811.
Khoo, F. Y., 16977.
Kibrick, A., 18749.
Kielholz, A., 16370.
Kihlberg, J., 16120, 17209.
Kihn, B., 16060, 17639.
Kimbrough, J. C., 16234.
Kimura, N., 18847.
Kindel, M., 16959.
King, C. G., 17421.
King, H. F., 17207.
King, J. T., 15829.
King, S. H., 16148.
Kinnaman, J. H., 16270.
Kinsell, L. W., 17481.
Kintner, A. R., 18055.
Kirakawa, K., 18595.
Kirber, H. P., 17700.
Kirchmayr, W., 17549.
Kirk, J. E., 16733, 16751, 17419, 17472, 18347, 18406.
Kirkland, K., 18788.
Kirkpatrick, A. L., 17334.
Kirkpatrick, C. M., 17575, 17667.
Kirnberger, E. J., 16993.
Kirsner, J. B., 18464.
Kiser, C. V., 16918.
Kish, H., 17401.
Kishii, M., 18446.
Kishikawa, M., 18447.
Kishimoto, M., 18361, 18392.
Kitaoka, M., 18495, 18542, 18543, 18544.
Klapprodt, C., 18584.
Kleemeier, R. W., 16108, 17981.
Kleh, J., 16865, 17613.
Kleiber, M., 17473.
Klein, E., 17510.
Klenitskii, Ia. S., 18580.
Klingmüller, G., 17081.
Klose, V. T., 17381.
Kluczny, J., 18348.
Klumpp, T. G., 16766.
Knight, R. A., 16628.
Knobloch, H., 16718.
Knudson, A. B., 17359.
Knutson, D., 18100.
Kobayashi, H., 18915.
Kobayashi, T., 18705.
Koch, A. R., 16537.
Kochakian, C. D., 18478.
Kochi, Y., 18581.
Kocovskij, D., 16599.
Koda, H., 18695.
Kodama, K., 18245.
Koenig, F., 16960.
Koets, P., 17068.
Koff, S., 15898.
Koga, H., 18448.
Kogel, M. D., 16271.
Koguchi, M., 18662.
Kohara, H., 18663.
Koike, K., 18617.
Kojima, K., 18664, 18665, 18666.
Kolb, L., 17949.
Koller, F., 17066.
Koller, M., 18094.
Kominami, M., 18903.
Kon, S. K., 15810.
Kondo, D., 18449.
Kondo, T., 18618.
Kondo, Sh., 18283.
Konterwitz, H., 17685.
Korchin, S. J., 16371.
Korenchevsky, A., 16701.
Korenchevsky, V., 18418.
Kornzweig, A. L., 17709.
Kortschak, W., 16052.
Koskenoja, M., 16109, 16742.
Kotsovsky, D., 15727, 15922, 16345, 18182.
Kottmeier, H. L., 16808.
Kountz, W. B., 15811.
Kourias-Basile, —., 17961.
Koutsky, J., 16018.
Kovach, J., 16901.
Kowalewski, K., 17576.
Kowalski, H. J., 15909.
Kraft, E., 15744.
Krag, C. L., 18815.
Kraheck, G., 16019.
Krapf, E. E., 16312.
Kraus, H., 18545.
Krauss, H., 16272.
Krauss, T. C., 17360.
Krebs, K. G., 17369.
Kreis, H. A., 16629.
Krevans, J. R., 17482.
Krewer, B., 17059.
Krippaehne, M. L., 15853.
Kristeller, E. L., 17762.
Krosnick, A., 17550.
Krüger, E. H., 17130.
Kruesi, O. R., 15862.
Krusen, F. H., 16538, 18816.
Krute, A., 18101.
Kuba, A. L., 17966.
Kubo, I., 18546.
Küchenhoff, O., 17497.
Küchenhoff, T., 17497.
Küntscher, G., 18696.
Kuhn, R., 17547.
Kuhn, W., 16702, 17490.
Kuhns, J. G., 17725.
Kuhns, W. J., 16965.
Kuipers, R. K. W., 18739.
Kukowka, A., 16149.
Kulonen, E., 16966.
Kulowski, J., 15745.
Kulp, J. L., 16561.
Kumagaya, H., 18315.
Kumatori, T., 18307.
Kumlin, T., 18724.
Kumnick, L. S., 16954, 16955, 17710.
Kuplan, L., 16494.
Kupper, —., 16061.
Kupperman, H. S., 17577.
Kure, M., 18667.
Kurihara, M., 18357, 18358.
Kurland, A. A., 17927.
Kurlander, A. B., 16273.
Kuroyuwa, Y., 18480, 18496, 18522, 18668, 18848, 18867.
Kurzrok, R., 15935.
Kuschner, M., 18619.
Kutner, B., 18874.
Kuwahara, M., 18344, 18359, 18360, 18391, 18460.
Kuzell, W. C., 17067, 17068.
Kuzuya, N., 18259.
Kyser, F. A., 18349.

L

Laadt, J. R., 18380.
Laake, H., 16134.
Labecki, T. D., 15889.
Laborit, H., 17491.
Lachmann, H., 16739.
Lackner, R., 17751.
Lafferty, C. R., 16020.
Lagarde, —., 16981.
Laine, V. A., 17001, 17002, 17804.
Lamanna, G., 17256.
Lambert, G. F., 15832, 15833, 15834.
Lamphier, T. A., 17790.
Lancaster D., 16809.
Lancaster, E. S., 17299.
Lancaster, H. O., 17438, 18219, 18220.
Landabure, P. B., 16810, 18183.
Landis, E. M., 16711.
Landowne, M., 15890, 15907, 15923.
Langdale-Kelham, R., 16539.
Lange, G., 16274.
Langer, H., 16841.
Langley, M., 18126.
Langvad-Nielsen, A., 18789.
Lansing, A. I., 17402.
Lantz, E. M., 17928.
Lapides, J., 15815.
Larcan, A., 16224.
Lareng, L., 17640, 18809.
Laroche, C., 15950, 15951, 16002.
La Rosa, F., 15952.
Larson, A., 17335.
Larson, L. W., 18823.
Lasagna, L., 16902, 18547.
Lascalea, M. C., 15728, 16888, 17595.
Lasnitzki, I., 17098.
Laspiur, R. D., 16880.
Lassner, R., 17161.
Laszlo, D., 18260.
Latorraca, R., 17853.
Latysheva, N. I., 16062.
Laue, H. G., 17248.
Laugier, M., 19072.
Lauriat, P., 19021.
Laursen, R. S., 18406.
Laursen, T. J. S., 18406.
Lavik, P. S., 17591.
Lawkowicz, W., 17494.
Lawrence, J. S., 17003, 17805.
Lawrence, M., 17361.
Lawton, C., 17736.
Lax H., 18350.
Leach, B. E., 15834.
Leathem, J. H., 18261.
Lebo, A. A., 16245.
Leclercq, M., 17578.
Le Coulant, P., 17842.
Lederer, J., 16204.
Ledoux-Lebard, G., 16135.
Lee, P. R., 17038.
Leege, O. H., 16210.
Leeksma, C. H., 15852.
Lees, H., 17382.
Leffel, J. M., 17192.
Lefkovits, A. M., 16150.
Lehman, E. L., 16295.
Lehman, H. C., 17982, 18904.
Lehmann, J. L., 15764, 18884.
Lehner, E., 16540.
Leighniger, D. S., 15905.
Leikola, E., 16044.
Leite, G., 17641.
Lel'chuk, P. Ia., 16811.
Leman, C. B., 18420.
Lemieux, L. H., 16876.
Lemon, H. M., 17004.
Lennartz, H., 17614.
Lent, M. H., 17109.
León, A. P., 18246.
Leonard, V. B., 18311.
Leonti, F., 17427, 17501.
Lepisto, V. E., 16953.
Lepkowski, J. R., 18082.
Lequime, J., 16136.
Leser, C. E. V., 17439.
Letourneau, C. U., 16275.
Levchenko, M. N., 16712.
Leverton, R. M., 17474, 17475, 18262, 18263.
Levesconte, H. P., 17362.
Levi, L., 16812.
Levin, E., 16235.
Levin, M. L., 18866.
Levin, N., 17686.
Levine, A. H., 15891.
Levinson, B. M., 17983.
Levinson, L., 18620.
Lew, E. A., 16313, 16649, 16650, 18212.
Lewi, M. T., 17131.
Lewis, A. E., 18527.
Lewis, L. A., 18317.
Lewis, N. D. C., 17953.
Lewkowicz, K., 16151.
Leypold, F., 16813.
Lhermitte, J., 17005.
Lichtwitz, A., 18706.
Light, A. E., 18759.
Lilienfeld, A. M., 17664, 18221.
Limarzi, L. R., 15847.
Linden, M. E., 17162, 18849, 18850, 19020.
Lindgren, F. T., 15861.
Lindgren, I., 16098.
Ling, J. C., 16001.
Linkhardt, M., 15801.
Linn, L., 18687.
Linnell, R. H., 17370.
Linquette, M., 15953.
Linton, M. A., 18973.
Lipkin, E., 16178.
Lipman, D. C., 17528.
Lipsett, M. B., 15891.
Lipton, M. A., 18600.
Lister, W. A., 17687.
Little, M. H., 17280.
Littman, R. A., 18905.
Litzendorff, O. H., 17036.
Livingston, K. E., 16877.
Livingstone, R., 17281.
Ljunggren, H., 15863.
Ljuština-Ivančič, N., 18669.
Llombart, A., 17440.

Lloyd, R. G., 18083.
Lloyd, W. E., 17688.
Lloyd-Roberts, G. C., 17737.
Lob, A., 16967.
Lober, P. H., 15924.
Lockhart, H. B., 15833.
Lockie, L. M., 17827.
Loewe, W. R., 18338.
Logan, A. H., Jr., 16825.
Lokshin, H., 19046, 19047.
London, P. S., 17037.
Long Beach California Community Welfare Council, 18084.
Longhi, A., 17836.
Looney, J. M., 17004.
Loosen, H., 16762.
Lopez, M. R., 16919.
Lorato, C., 15735.
Lorch, P., 17059.
Lorenzini, R., 15867, 17511.
Lorge, I., 16463, 17984, 17985.
Lorhan, P. H., 16063.
Lotterhos, W. E., 17878.
Louros, M. N., 16920.
Loustalot, P., 16630.
Lowe, C. R., 17642.
Lowe, P. J., 16543.
Löwen, C. H., 17132.
Lowenberg, E. L., 18351.
Lowenstein, F. W., 17529.
Lowman, E. W., 16541, 17038, 18127.
Lowrey, J. J., 17615.
Lowry, O. H., 17701.
Lucas, D., 19015.
Lucherini, T., 17763, 17764.
Luchsinger, J., 16921.
Luft, R., 15863.
Lugaresi, F., 18497.
Lund, E., 17133.
Lundeberg, K. R., 16641.
Lundy, J. S., 18501.
Lunsford, W., 18284.
Luongo, E. P., 16276.
Luštinec, K., 17476.
Lutz, S., 17105.
Lutze, E., 18038.
Luxembourg. Ministère des Affaires Economiques, 16402.
Lyda, W., 18670.
Lydall, H., 17246.
Lynes, R., 18153.
Lyons, E. C., 16256.
Lyons, H. A., 16767.
Lyons, J. S., 16693.
Lytton, L. G., 17707.

M

Maass, G., 17614.
McAtee, W. L., 15753.
McAvoy, G. H., 15792.
McBride, J. M., 16814.
Maccaferri, A., 18306.
McCall, M. S., 15855.
McCamman, D., 16482, 19002, 19006.
McCance, R. A., 16690, 18312.
McCann, C. W., 19010.
McCann, M., 17643.
McCarthy, H. L., 17322.
McCarthy, R. A., 17929.
McCartney, J. L., 17616, 18851.
MacCarty, C. S., 15970.
McCay, C. M., 17483, 18284, 18332.
McChesney, E. W., 15830.
McClellan, W. S., 16542.
McClintock, A., 18582.
MacClure, D., 16571.
McConnell, J. W., 16430, 18025.
McCranie, E. J., 16021.
McCrea, L., 17863.
McCullagh, M., 17665.
McDermott, L. K., 17806.
McDevitt, E., 17627.
McDonald, G. O., 18498.
McDonald, H. P., 17864.
McDonald, J. R., 18631.
MacDougall, J. A., 17336.
McEnery, W. B., 18419.
McFarland, R. A., 16110, 17986.
MacFarlane, D. A., 18420.
McFarlane, E. M., 17441.
McGavack, T. H., 15954, 15955, 18421.
McGavin, S., 17563.
McGhee, R. B., 18548.
McGill, D. M., 17272, 18974.
McHaney, P. B., 18102.
Machella, T. E., 15831, 17484.
Macías Castro, I., 16022.
McIntosh, H. D., 17078.
Mack, M. J., 16451.
McKenzie, A., 15771, 17666.
MacKenzie, D. H., 16940.
McKenzie, J. M., 16941.
McKeown, T., 16080.
Mackey, H. O., 17837.
McLaughlin, C. W., Jr., 16815.
MacLennan, D. C., 15828.
MacLeod, J. G., 16988.
McMahan, C. A., 15754, 16651.
McNeill, R. S., 16941.
MacRae, T., 16968.
Maddison, J., 17893.
Madonick, M. J., 16878.
Madsen, E. T., 17085.
Madsen, J., 16652.
Maekawa, T., 18307, 18824.
Mäkinen, P., 16966.
Magee, K. R., 16023.
Maggi, V., 15885.
Maggipinto, B., 17579.
Magliocca, R., 15958.
Magnani, B., 17689.
Magnus, H., 17695.
Maher, H., 16431.
Mahlo, A., 15986, 18450.
Mahood, M. E., 17757.
Maier, W., 18010.
Maine. Committee on Aging, 19011.
Mainland, D., 17930.
Maitre, M., 17719.
Malaise, E. V., 18906.
Malan, E., 17962, 18887.
Malkasian, H. A., 19030.
Mallen-Goria, I., 16786.
Mallery, O. T., Jr., 17882.
Malleson, J., 16816.
Maluf, N. S. R., 16236.
Malzberg, B., 16314, 16315, 17931.
Mandelbaum, D. G., 16082.
Mangalik, V. S., 17099.
Manganotti, G., 17838, 17839.
Mankle, E. A., 17068.
Mann, G. V., 15812, 17512.
Manning, R. A., 17039.
Manova, M I., 17663.
Månsson, O., 17286.
Manucso, T. F., 17441.
Manukian, K. G., 16024.
Marassi, M., 18740.
March, H. W., 17551.
Marchand, M., 16152.
Marchenko, V., 18932.
Marcotte, D., 17383.
Marcus, D. M., 17469.
Marcus, S., 17644.
Maréchal, A., 17006.
Margolis, H. M., 16179, 17151.
Mark, R. E., 16956.
Markham, R. L., 17752.
Marks, H. H., 16313.
Marks, M., 18128.
Marlberger, H., 17856.
Marmorston, J., 16777, 17580.
Márques, F. J., 18477.
Marrazzi, G., 17047.
Marrian, G. F., 16158.
Mars, G., 16025, 16137, 16942.
Marsh, R., 16065.
Marshall, E. A., 18451.
Marshall, J., 18499.
Marson, F. G., 17069.
Martin, C., 16064.
Martin, J. D., Jr., 18452.
Martin, W. C., 18285.
Martin, W. J., 16675, 17462.
Martín Baztarrica, J., 18039.
Martínek, J., 17601.
Martinelli, M., 17581.
Martini, G., 16879.
Martucci, A. A., 18817.
Martz, E. W., Jr., 16179.
Masaki, M., 18453.
Mason, C., 18129.
Mason, H. L., 17058.
Mason, R., 17150.
Mason, R. M., 17828.
Massachusetts. Council for the Aging, 19048.
Massano, A., 16083.
Master, A. M., 15892, 16768.
Masters, W. H., 18422.
Masters, Y. F., 16776.
Masturzo, A., 17007.
Masukawa, A., 18387.
Matera, R. F., 16880.
Mathé, G., 15848, 16002.
Mathen, K. K., 17163.
Mather, L. K., 16464.
Mathes, S., 16065.
Mathiasen, G., 18990.
Mathieu, J., 16923.
Matoltsy, A. G., 17416.
Matsuda, Sy., 18613.
Matsui, T., 18354.
Matsumoto, H., 18388, 18390.
Matsumoto, Y., 18378.
Matsuno, N., 18253.
Matsuo, I., 18818.
Matsuoka, T., 18448.
Matsuura, T., 18583.
Mattei, C., 16316, 17840, 17945.
Matthews, R. A., 16317.
Mattison, B. F., 15956.
Mattox, V. R., 17058.
Matuoka, Sy., 18184.
Matwejew, M. P., 17008.
Mauer, E. F., 17040.
Mauermayer, W., 17100.
Maumenee, A. E., 17717.
Maurer, H. J., 16318.
Mauser, F. F., 16495.
Maw, W. A., 17514.
Maxwell, R. D. H., 18339.
May, J. R., 16943.
May, R., 18352.
May, R. M., 17417.
Mayer, A. J., 17442, 18572, 18584.
Mayer, E., 17690.
Mayer, J., 16903, 17645.
Mayo, L. W., 17164.
Mayock, P. P., 17865, 17866.
Mazzone, O., 17753.
Mead, A. R., 18210.
Mead, J., 16098.
Mead, S., 19049.
Meadors, G. F., 17443.
Meadow, L., 17987.
Meanock, R. I., 17751.
Means, R. L., 15987.
Meda, A., 15912.
Meerloo, J. A. M., 17165, 17166.
Megowen, V. A., 17287.
Mehrotra, R. M., 17099.
Meixner, H. K., 16180, 17807.
Mella, L., 15988.
Memin, Y., 17541.
Mendelek, V., 17009, 18726.
Mendenhall, J. T., 17678.
Mené, G., 18727.
Meneghini, P., 17070.
Mercer, W., 16181.
Merchant, W. R., 16987.
Meredith, J. M., 17726.
Merino, C., 16708.
Merlis, S., 16319.
Meroni, G., 15735.
Merrill, A. P., 16277.
Merrill, G. G., 17199.
Messeloff, C., 16065.
Messent, A. D., 15893.
Messina, B., 15883.
Mestler, G. E., 16213.
Metcalf, W. K., 16706.
Metrop. Life Insur. Co., 15772, 15773, 15774, 15775, 15776, 15777, 16320, 16386, 16465, 16483, 16653, 16654, 16676, 17208, 17226, 17444, 17445, 17894, 18222, 18454, 18852, 18916.
Meyer, E., 17167.
Meyer, J., 17582.
Meyer, K. H., 17731.
Meyer, W., 18790.
Meyers, R. I., 18130.
Mezić, A., 17168.
Miall, W. E., 16153, 16740.
Miatello, V. R., 17596.
Michaux, L., 16321.
Michel, D., 16750.
Michels, B., 15857.
Michotte, L., 17041.
Mickelsen, O., 17509.
Miescher, K., 17403.
Mifune, M., 18843.
Mignon, J., 19028.
Miguel, M. A., 16731.
Mikinka, F., 16931.
Milburn, A. A., 18907.
Milcou, S., 15729.
Millard, J. B., 17358, 17798.
Miller, D. S., 17738.
Miller, H. H., 16572.
Miller, M., 16466.
Miller, P. B., 17042.
Miller, R. D., 16944.
Miller, R. M., 16950.
Milles, G., 15988, 18389.
Millikan, C. H., 18501, 18502.
Millman, M., 18286.
Millot, J. A., 19073.
Mills, G. T., 15813.
Milmore, B. K., 16655
Milner, W. A., 17867.
Minami, K., 18760.
Minami, S., 18819.
Minckler, J., 15898.
Minnesota Commission on Aging, 16496, 17307.
Mirabeau, M., 18353.
Mirouze, J., 16978.
Misao, T., 18503.
Mishima, K., 18455.
Mitchell, A., 18262, 18263.
Mitchell, C. J., 18500.
Mitchell, F. D., 17102.
Mittelman, A., 17860.
Mittelmann, B., 17932.
Miura, T., 18495, 18542, 18543, 18544.
Miyahara, M., 18480.
Miyao, S., 18354.
Miyazima, T., 18697.
Mizutani, K., 18549.
Moberg, D. O., 16507.
Modica, G., 17516.
Moersch, F. P., 18502.
Mohnike, G., 15814.
Moine, C., 18223.
Moine, M., 18223.
Mól, A., 16855.
Moldawer, M., 16979.

Molina, G., 15802.
Moltke, O., 16842.
Momose, M., 18671.
Monat, H. A., 16769.
Monnerot-Dumaine, M., 16904.
Monsaingeon, A., 16349.
Montanari, L., 17581.
Monteiro, H. P., 18376.
Montgomery, W. W., 18621.
Moor, —, 16363
Moore, M. T., 16881.
Moore, N. W., 18211.
Moran, P. A. P., 17227.
Morani, A. D., 16350.
Morano, E., 16817.
Morduchowicz, N., 17056.
Morehead, M. A., 17214.
Morel, F., 18853.
Morel, L., 17818.
Morelewicz, H. V., 17360.
Morettini, A., 17012.
Moretz, W. H., 18355.
Morgan, D. R., 17169.
Morgan, I. M., 17646, 17647.
Mori, Sh., 18423.
Morikawa, T., 18192, 18456, 18457, 18518.
Morimoto, H., 15989.
Morin, G., 18735.
Morin, M., 15894.
Morishima, K., 18803.
Moritsch, P., 18458, 18888.
Moriyama, I. M., 16656.
Moroni, P., 17841.
Morooka, T., 18622.
Morpurgo, M., 16025, 16137.
Morris, G. L., 17552.
Morris, J. N., 16770.
Morris, R., 16322, 17134.
Morrison, L. M., 16771, 17553.
Morse, E. H., 17485.
Mort, M., 17351
Mortara, G., 18040, 18933.
Mortensen, H., 18791.
Mortensen, J. D., 18424.
Moschette, D. S., 17477.
Moscoso, T., 16615.
Moser, L., 16452.
Mosetti, F., 16639.
Mossman, H. W., 17667.
Mountin, J. W., 16484.
Moyer, W. E., 15990.
Mruk, J., 18425.
Mucci, A., 15867.
Muehlenbein, J. M., 16508.
Müller, E., 17043.
Mueller, W., 17706.
Mueller, W. J., 18264.
Muhsen, J., 17101.
Mulvey, G. F., 16497, 17308.
Mumenthaler, M., 16453.
Mumford, L., 18991.
Munson, P. L., 18420.
Murai, Y., 18908.
Murakami, H., 18544.
Murakami, M., 18356, 18357, 18358, 18359, 18360, 18361, 18390, 18391, 18392, 18697.
Murland, E., 16899.
Murphy, C., 17537.
Murphy, J. J., 15815.
Murphy, J. P., 16882.
Murrill, R. I., 17530.
Myers, G. B., 17569.
Myers, J. A., 17691.
Myers, R. J., 16516, 16517, 16657, 16945, 17273, 17337, 17338, 17446.

N

Nabatoff, R. A., 16729.
Nachtwey, D. S., 16624.
Nadel, M. B., 18299.
Naef, D., 16844.
Nagasawa, J., 16096.
Nagasawa, Y., 18623.
Nagashima, Sh., 18423.
Nagera, J. M., 16026.
Nagler, J. H., 18854.
Nagley, L., 18792.
Nahas, H. C., 17558.
Nakai, T., 17449.
Nakajima, H., 18611, 18613, 18624, 18625.
Nakamura, H., 18480, 18668.
Nakamura, J., 18287, 18288.
Nakamura, T., 18518.
Nakamura, Y., 18672.
Nakao, S., 18296.
Nakaoka, T., 18443.
Nakayama, Ts., 18697.
Nakazima, H., 18614.
Nakazima, M., 18362.
Nakazima, Y., 18524.
Namen, J. M., 16543.
Naniwa, T., 18761.
Nanta, —, 17082.
Natale, P., 17763, 17764.
Nathan, A., 16741.
Nathanson, D., 17695.
National Association of Manufacturers. Industrial Relations Department. Policy Committee Division, 16454.
National Health Council, 18855.
National Insurance Retirement Pensions, 18041.
Natoli, A., 15958.
Natvig, H., 16631.
Naugler, W. E., 17067, 17068.
Nava, P., 16154, 16155, 17765.
Naylor, A., 16968.
Nebraska Legislative Council, 18856.
Necheles, H., 17582.
Nedilsky, B. T., 17157.
Needell, M. H., 17102.
Neetens, A., 18645.
Negri, L., 16126.
Neher, G. M., 17013.
Neilson, R., 15909.
Neirotti, P. G., 16092.
Nelson, E. L., 16295.
Nelson, W. O., 18419.
Nemerof, H., 17933.
Neri Serneri, G. G., 17012.
Netherlands. Centraal Bureau voor de Statistiek, 15803, 16403, 17228.
Netherlands. The Hague. Gemeentelijk Bureau voor de Statistiek, 18011.
Neuberger, P., 16818.
Neufeld, I., 16005.
Neufeld, O., 18626.
Neumayer, E., 16883, 18504.
Nevskaia, T. L., 18550.
Newell, F. W., 16957.
Newman, H. R., 18793.
Newman, L. B., 17934
Newman, R. W., 16066.
New York. State Commission on Pensions, 18975.
New York. State Conference on Aging, 17404.
New York. State Department of Commerce, 16412.
New Zealand. Census and Statistics Department, 18956.
New Zealand. Department of Island Territories, 17229.
Niccolini, G., 18707.
Nichols, G. D., 16877.
Nicholson, E. E., 16278, 17935.
Nicol, B. M., 17512.
Nielsen, O., 18069.
Nielson, H. C., 18934.
Niemi, T., 16600, 16905.
Niesert, H. W., 16819.
Nikkilä, E., 15868.
Nilsen, B. F., 16631.
Nishihara, A., 18253.
Nishikawa, I., 18276, 18357, 18358, 18359, 18360, 18361, 18363, 18391, 18392, 18393, 18394, 18551, 18762, 18824.
Nishino, Ch., 18820.
Nishiura, Ts., 18798.
Nissen, R., 17193.
Niswander, G. D., 17157.
Nitzany, C. U. (Genazzani), 15730.
Noble, N. L., 15746.
Nöcker, J., 16713, 18316, 18552.
Noetzel, A. J., 16436.
Noguchi, Sh., 18505.
Nomura, Sh., 18459.
Nonouchi, Y., 18423.
Noonan, T. R., 16058.
Norman, C., 18857.
Norman, V. B., 18947.
Norment, W. B., 16922.
Noro, L., 17209.
Norris, V., 16308.
Norstrand, I. F., 17617.
North, A. C., 17563.
North Carolina. Recreation Commission, 19050, 19051.
North Carolina. State Board of Public Health, 18064.
Northern Ireland. General Register Office, 16677.
Northern Ireland. General Registry Office of Births (Scotland), 18012.
Northup, G. W., 17648.
Northway, W. H., 16544.
Norton, A. H., 17603.
Norton, J. W., 16323.
Norway. Statistisk Sentralbyrå. 16404.
Norwegian Joint Committee on International Social Policy, 19031.
Norymberski, J. K., 15934, 18426.
Novak, E. R., 17583.
Nowlis, G. R., 16016.
Nowy, H., 16102.
Noyes, A. P., 17936.
Nudelman, H., 18027.
Nunes, C. V., 17766, 18741.
Nyboer, J., 16056.
Nye, R. E., Jr., 18627.
Nyssen, R., 16372.

O

Oberkircher, O. J., 17109.
Oberling, C., 16324.
Obi, S., 17711.
Obreshkove, V., 15816.
Occhipinti, S., 18887.
O'Connell, B. A., 16325, 18858.
O'Connor, —, 18427.
O'Connor, N., 17907.
Oda, A., 18585.
Oeriu, S., 18318, 18319.
O'Ferrall, J. M., 18364.
Office of Defense Mobilization. Health Resources Advisory Committee, 18957.
Offret, G., 16111, 17715.
Ogg, E., 16509.
Ogoshi, M., 18794.
Oguchi, M., 18673.
Ogura, M., 18395.
Ohara, T., 18308.
Okamoto, K., 18460.
Okayasu, K., 18553, 18554, 18555.
Okinaka, Sh., 18859.
Okubo, K., 18495, 18544.
Okuda, K., 17500.
Olansky, S., 17175.
Olbrich, O., 17893.
Oldham, P. D., 16740, 16756.
Olinder, O., 17463.
Olitsky, P. K., 17650.
Oliver, L. C., 16884, 17618, 17619.
Oliver, M. F., 17554, 18880.
Olsson, I. K., 16216.
Omura, S., 18449.
O'Neill, F. J., 16319.
Onishi, K., 18763.
Orchard, N. P., 15869.
Oregon. Governor's Committee to Study Problems of the Aging, 16498.
Orma, E., 16109, 16601, 16742.
Orme, J. E., 17988.
Orr, L. M., 18799.
Ortiz, E., 17668.
Orto, L., 15819.
Orzalesi, F., 18674.
Osamura, Sh., 18635.
Osberg, J. W., 17584.
Osborn, J. J., 16067.
Osborne, R. T., 16373, 17989.
Osgood, E. E., 15853.
O'Shaughnessy, E. J., 18795.
Ossicini, T., 17969.
Ossman, S., 16413.
Östberg, E. W., 15781, 15991.
Ostow, M., 18687.
Ota, K., 18330.
Ott, N., 18839.
Ottawa. Department of National Health and Welfare. Nutrition Division, 17649.
Outes, D. L., 16880.
Owchar, M., 17447.
Ozawa, S., 18821.

P

Pacaud, S., 16374, 17200.
Padawer, J., 18193.
Padovani, G., 17170.
Padovani, J., 16996.
Pärtan, J., 17761.
Paes Moraes, J. J., 16405, 18247.
Pagani, A., 15731, 15735, 19012.
Page, I. H., 18317.
Page, J. A., 17044.
Pages, F., 17767.
Pagnini, G., 18889.
Paish, F. W., 16414.
Pakesch, F., 17852.
Pakistan. Office of the Census Commissioner, 18013.
Palenzona, C., 17296.
Palis, A., 17721.
Palmer, C. E., 18637.
Palmer, W. L., 18464.
Palmisano, P., 16182.
Palmisano, T., 17339.
Palmoni, Y., 17405.
Palou, J., 17620.
Palumbo, F., 16065.
Panama. Dirección de Estadística y Censo, 17230.
Paparelli-Pirani, C., 17808.
Papas, P. N., 17790.
Paquin, H. O., Jr., 15756.
Parade, G. W., 18728.
Parenti, G. C., 17194.
Parfentjev, I. A., 15874, 18556.
Parhon, C. I., 18318, 18319.
Park, C. B., 17464.
Parker, R. T., 18764.
Parlier, R., 18706.
Parr, D., 16885.
Parr, L. J., 17768.
Parrini, L., 16183.
Parrino, P. S., 18795.
Parry, C. B. W., 17352.
Parsons, L., 17669.
Pascua, M., 15778.

Pasquale, G., 16099.
Passanante, D. A., 15732.
Patet, J., 17818.
Patrick, R. M., 17477.
Paul, J., 15813.
Paulsen, G. A., 18628.
Pautrat, J., 16980.
Payne, B. F., 17712.
Payne, R. W., 16801.
Payno, M., 17895.
Payot, J., 16033.
Pazur, J., 17474.
Peabody, C. W., 16184.
Peacock, A., 16123.
Pearlman, C. K., 17103.
Pearlmutter, M., 16065.
Pearson, O. H., 18265.
Pearson, R. B., 18519.
Pearson, S., 15955.
Peckenschneider, L. E., 16946.
Pecora, D. V., 16100.
Peel, A. A. F., 16772.
Peel, C., 16068.
Pehl, R., 17769.
Pell, S., 16281.
Pellâthy, B., 16958.
Pellegrini, R., 17340, 18103.
Pelner, L., 18860.
Pemberton, H. S., 16906.
Pemberton, J., 16310, 17890.
Pennaneac'h, —., 16981.
Pennybacker, J., 18506.
Penrose, L. S., 16697.
Penzani, B., 18675.
Pepler, W. J., 17508.
Peregalli, P. F., 18698.
Pereira, J., 16573.
Pérez, M. L., 17670.
Perlstein, I. B., 17010.
Pernod, J., 17541.
Perone, P. M., 18621.
Perrini, M., 16835, 17071.
Perrott, G. St. J., 19005.
Perruchio, —., 16981.
Perry, V. P., 18765.
Persky, L., 17868.
Personnel Club of New York, 17257.
Pestalozza, G., 18676.
Peszcyński, M., 18131, 18132, 18507, 18804.
Peters, H., 17513.
Peterson, P., 15959.
Petges, G., 17842.
Pethica, B. A., 16704.
Petito, S., 17632.
Petrilli, G., 17955.
Petrovic, A., 16820.
Pett, L. B., 16069, 18289.
Petty, H., 16185.
Petz, B., 16432.
Peutsch, W., 16841.
Pezzolo, A., 17406.
Pfister, H. O., 17297.
Pflugfelder, O., 16821.
Phenix, F. L., 18133.
Phillips, A. J., 17447.
Phillips, A. M., 16100, 17692.
Phillips, R. W., 16100, 16658, 17692, 17829.
Piantoni, G. H., 17713.
Piatti, A., 18557.
Picciolo, D., 16707.
Pickrell, K., 17078.
Picón-Reátegui, E., 16708.
Pierik, M. G., 17039.
Pierson, A. L., 18201.
Pifer, M., 16901.
Piggot, A. P., 15920.
Pikkel, M. V., 16886.
Pincus, G., 15960, 15961, 15962, 18180, 18428.
Pineau, H., 17201.
Pinelli, L., 15919.
Pinsent, R. J., 16326.
Pinsonnet, F. 19074.
Pinto, A., 17671.
Piquet, B., 16203.
Piquinela, J. A., 16743.
Pirker, H., 17363.
Pirkis, J., 17751.
Planel, H., 18429.
Plantin, L. O., 16219, 16220.
Plas, F., 15925.
Platt, W. D., Jr., 16186.
Plevko, O., 18508.
Plichet, A., 15779.
Pocock, D., 17470.
Polemis, Z. M., 16415, 18027.
Pollack, B., 18861.
Pollak, O. J., 17531, 17532.
Polley, H. F., 17058, 18699.
Pollock, L. J., 18509.
Pollosson, E., 16923
Poloukhine, N., 16861.
Poltowicz, K., 18875.
Pomeranze, J., 15980, 15981.
Pond, M. H., 18729.
Ponomareva, E. D., 17188.
Ponsan, X., 16843.
Poos, E. E., 16112, 17714.
Pope, F., 18284.
Porem-Bińška, H., 17494.
Porta, C. F., 18677.
Porterfield, J. D., 17441.
Post, F., 16327, 17924.
Potgieter, M., 17485.
Power, M. H., 17058.
Prader, A., 16844.
Prankerd, T. A., 16709.
Pratt, G. H., 16744.
Pratt, I., 16628.
Pratt, J. H., 17672.
Pratt, R. T., 16027.
Prawitz, H., 16659.
Prendergast, L. J., 17856.
Prescott, D. M., 17418.
Pressat, R., 17221.
Pressavin, J. B., 19075.
Pressey, S. L., 16364, 16455, 18976.
Preston, R. L., 18134.
Preto Parvis, —., 15963
Pria, A., 18822.
Price, A. H., 15733.
Price, H., 16246.
Price, P. H., 15780, 18014.
Price-Jones, C., 17498.
Pridie, K. H., 17050.
Priessnitz, O. 17045, 17739.
Priest, R. J., 16838.
Primbs, G., 16295.
Primo, G., 16351.
Princi, F., 18629.
Prive, J. R., 17990.
Prodi, G., 17561.
Propst, A., 15931.
Prosser, E. L., 16420.
Prout, C. T., 17938.
Prudden, B., 18545.
Pruvot, P., 15953.
Pruzansky, S., 17187.
Psaki, R. C., 18519.
Puffer, R. R., 15802, 17693.
Pugh, D., 18699.
Puh Lee, Y. C., 15829.
Pumarola Busquets, F., 16247.
Pundt, A. G., 18015.
Pupi, R. E., 16782.
Pytel, A., 17869.

Q

Quadras-Bordes, M., 16924.
Quadras-Bordes, M. V., 16924.
Quaini, P., 17673.
Quinn, V. A., 18533.
Quintarelli, L., 18992.

R

Raad, M. A., 16845.
Rabaey, M., 18645.
Radcliffe, C. E., 15748.
Radino, G., 17809.
Radó, J., 18510.
Rae, J. W., Jr., 18742.
Rafalowski, I., 18461.
Raffaele, J., 16782.
Ragaini, S., 16942.
Ragan, C., 17750, 17770.
Raines, G. N., 17991.
Ramamurti, K., 16714.
Rambo, D. S., 17175.
Rammelkamp, C. H., Jr., 18525.
Ramsey, G. F., 18056.
Rancati, A., 15734, 19013.
Ranchinus, F., 19076.
Randall, H. T., 18890.
Randall, O. A., 16545, 16546, 17282, 18823, 18993.
Randall, R. V., 18408.
Rapp, V. W., 16547.
Rappaport, I., 17690.
Rasmussen, H. K., 17678.
Rasmussen, P., 17810.
Rasor, E. A., 17338.
Rasponi, L., 17533, 17534.
Ratcliffe, A. H., 16870.
Rattner, H., 18766.
Ratzenhofer, M., 15931.
Raushenbush, C., 17258.
Raushenbush, S. 16456.
Rawson, R. W., 18430.
Raymond, F., 18881.
Rechenberger, J., 16715, 16716, 16717, 18365.
Rechtman, A. M., 17740.
Rechtschaffen, J., 15980, 15981.
Redazione, L., 17120.
Reed, R., 15930, 17562.
Reeder, M. W., 18948.
Reeh, M. J., 18678.
Rees, G., 17428.
Rees, T. P., 17171.
Reese, H. H., 16248.
Rehman, I. H., 15914.
Reich, T., 15897, 16660.
Reichenberg-Hackett, W., 18085.
Reicher, E., 17011.
Rejholec, V., 17777.
Renard, G., 17715.
Rennaes, S., 15781, 15991.
Renon, —., 16981.
Repaci, M., 15895, 16548, 17896.
Retbøll, G., 16187.
Reveno, W. S., 16279.
Reyniers, J. A., 19077.
Reynolds, M. C., 17074.
Reynolds, S. R., 15914.
Rhodes, J., 16549.
Riccardino, N., 17812.
Ricci, G., 15883.
Rich, A., 17564.
Rich, T. A., 17981.
Richards, D. W., Jr., 18602.
Richardson, E. M., 17060.
Richels, I., 16632.
Riegel, C., 16745.
Riemer, D., 16550.
Riese, W., 16887.
Rietman, H. J., 17939.
Rilke, F., 15963.
Rinaldi, F., 18489.
Rinehart, R. E., 17046.
Ringer, R. K., 16746.
Rinker, G., 17736.
Rinsky, A., 18086.
Ritama, V. V., 17002.
Ritter, H., 17172.
Rivano, R., 16854.
Rivers, D., 16146.
Rivers, E., 17175.
Riviere, J., 16822.
Rizzente, S., 16747.
Rizzi, M., 17811.
Robbin, S. R., 15881.
Robecchi, A., 17047, 17812.
Roberts, D. W., 16255, 17940.
Roberts, J., 16641.
Roberts, K. E., 18890.
Robertson, D., 15926.
Robinson, G. W., Jr., 17941.
Robinson, R. G., 17771.
Robinson, W. D., 16156.
Robles Gil, J., 17772.
Rockstein, M., 18266.
Rockwell, F. V., 17942.
Rodahl, K., 15896.
Rodarte, J. G., 17094.
Rodriguez y Rodriguez, E., 17895.
Rodríguez, G., 17298.
Roederer, J., 18767.
Roemer, G. B., 17158.
Roen, P. B. 18320.
Röttjer, E., 16888.
Rogel, R., 19032.
Rogers, F. B., 16028.
Rognato, C., 16101.
Romanoff, L. P., 15962.
Romeo, G., 16352.
Romero, H., 19052.
Ronge, A., 18087.
Root, H. F., 15964.
Rose, A. M., 17202.
Rose, W. C., 15832, 15833, 15834.
Rosenbaum, J., 16987.
Rosenberg, L., 17231.
Rosenberry, B. F., 17943.
Rosenbloom, D., 16237.
Rosenbluth, M. B., 17682.
Rosenfeld, L. S., 19005.
Rosenthal, H. L., 15826.
Rosenthal, I. M., 17187.
Rosenthal, O., 17420.
Rosenthal, P., 16375.
Rosolatto, P., 17143.
Ross, C. H., 16376.
Ross, J. C., 18796.
Ross, R. A., 15782.
Ross, W., 17341.
Ross, W. F., 16084.
Rosselli, M., 18370.
Rossitto, A. F., 18630.
Rossy, J., 15819.
Roth, F. B., 18862.
Roth, J., 17288.
Roth, M., 16874, 17159, 17173.
Rother, K., 17773.
Rothman, B., 16823.
Rothschild, D., 16328, 17944.
Rotta, C., 17945.
Rotteglia, E., 17048.
Rouher, F., 18679.
Rouquès, L., 17870.
Rouse, G., 17357.
Rowe, E. K., 17274.
Roy, L. M., 16157, 16158.
Rubarth, S., 16633.
Rubens-Duval, A., 16147.
Rubin, B. L., 15962.
Rubin, L. N., 16029.
Rucco, J., 19078.
Rudd, J. L., 18135.
Rudd, T. N., 17897.
Ruelle, M., 18730.
Ruge, H., 17371.
Ruggles, A. H., 16329.
Ruiz, V., 18431.
Rupp, C., 18511.
Rusche, C., 17104.
Rush, B., 15992.
Rush, E., 18185.
Rushing, J. B., 17694.
Rusk, H. A., 17038, 17152, 17624, 17886.
Russo, V., 17651, 17963.
Rutman, S., 17576.
Ryan, R. F., 18631.
Ryan, V. G., 16332.
Rzaśnicki, A., 18876.

S

Sabin, A. B., 17650.
Sacco, F., 16947.
Sachs, M. V., 17482.

Sacks, M. S., 17448.
Sabski, J., 18186.
Sailer, R., 18935.
St. Louis. Catholic Charities, 19014.
Saito, Ry., 18994.
Sajner, J., 16159.
Sakai, T., 18524.
Sakamoto, I., 18540.
Sako, K., 15988.
Sala, G., 17021, 17057, 17819, 17830.
Salaber, J. A., 16085.
Salamone, A., 17364.
Saldías Guzman, E., 17898.
Salganik, R. I., 15870.
Sambataro, C., 15994.
Samber, R., 18202.
Samet, P., 17681.
Sampson, J. J., 17535.
Samuels, G., 15747.
Samuels, L. T., 18321.
Sánchez Medal, L., 15850.
Sand, R., 18042.
Sandelius, G., 17423.
Sanders, W. B., 16373, 17989.
San Francisco Senior Center, 18136.
Sankowsky, G., 17486.
Santiana, A., 15993.
Sapisochin, E., 16748.
Sara, R., 18290.
Sarkizov-Serazini, I. M., 16907.
Sartwell, P. E., 16330.
Sasa, R., 18476.
Sasamoto, H., 18632, 18633.
Saslaw, S., 16908.
Sass, M., 18451.
Sato, B., 18432.
Sato, Ch., 18680.
Sato, H., 17449.
Sato, J., 18524, 18558, 18768, 18769.
Sato, K., 18366.
Sato, T., 18681.
Sato, Y., 18770.
Sattelmacher, P. G., 17674.
Sauerteig, E., 16611.
Saunders, F. J., 18256.
Saurer, A., 16824.
Sauvy, A., 18016.
Savage, A., 17429.
Savage, O., 17049.
Savl'Ev, A. A., 16909.
Sawa, Jy., 18909.
Sawicki, S. J., 18877.
Saxl, H., 15930, 17562.
Sbarbi, M. A., 16312.
Scalabrino, L., 16160.
Scarcello, N. S., 18104.
Scardigli, G., 16160, 17517.
Scarlett, E. P., 16602.
Scazzigo, B. R., 15965.
Scevola, P., 15994.
Schack, J. A., 17557.
Schaefer, J., 16908.
Schäfer, R., 16982.
Schäfer, W., 18863.
Schaffarzick, R. W., 17067, 17068.
Schaie, K. W., 16377, 16378.
Schall, L. A., 18621.
Schattien, W. E., 17868.
Schattner, A., 17079.
Schaus, R., 17407, 17419.
Scheele, L. A., 17946.
Schepers, G. W., 17690.
Schergna, E., 16030.
Schettler, G., 17536.
Schiki, A., 16773.
Schilder, P., 17184.
Schimatzek, A., 17095.
Schindler, H., 17015.
Schinz, H. R., 15897, 16660.
Schismes, H., 17174.
Schivetti, L., 17813.
Schleicher, I., 17637.
Schlichther, W., 17917.
Schlieke, C. P., 16825.
Schlossmann, K., 16161.
Schmid, C. F., 17450.
Schmid, J., 17723, 17761.
Schmidhauser, J. R., 18977.
Schmidt, C. F., 18494.
Schmidt, F., 17474, 17475.
Schmidt, P., 16889.
Schmidt, W. H., 18137.
Schmitz, B., 19019.
Schneider, J. A., 17486.
Schneider, P., 17372.
Schneiderbaur, A., 15854.
Scholten, I., 16826.
Scholz, D. E. 17019.
Schott, J., 16749.
Schottland, C. I., 16518, 17342.
Schraer, H., 16976.
Schreuder, O. B., 16433.
Schrimpf, H., 16925.
Schubardt, I., 16739.
Schubert, M., 16141.
Schuessler, R., 19087.
Schützenberger, M. F., 18571.
Schuknecht, H. F., 16113.
Schultz, S., 16302.
Schultzenberger, M. P., 19019.
Schulz, F. H., 16718, 16750.
Schumacher, H., 16188.
Schuman, S. H., 17175.
Schwab, R. S., 16031, 17605, 18512.
Schwaetz, D., 17621.
Schwartz, F. F., 17814.
Schwartz, L., 16420.
Schwartz, S., 17050, 17695.
Sciagrà, A., 17012.
Scialli, V. A., 16741.
Scopinaro, D., 16854.
Scott, E. V. Z., 17871.
Scott, F. G., 17309.
Scott, J. H., 18910.
Scott, R. B., 16827.
Scott, R. M., 16138.
Scott, W. W., 16227.
Scoville, W. B., 16331, 16332.
Seager, C. P., 16333.
Seal, R. M., 16146.
Seaquist, M. R., 17966.
Sebardt, G., 17051.
Sebizius, M., 19079.
Seckfort, H., 16719.
Seda, H., 16155, 18708.
Seegal, D., 17121.
Seegers, W., 18421.
Seeman, B. S., 17448.
Seemann, D., 18504.
Segagni, E., 18634.
Seib, C. B., 18154.
Seige, K., 16934.
Seki, M., 18276, 18322, 18357, 18358, 18359, 18360, 18361, 18367, 18368, 18369, 18391, 18392, 18396, 18397, 18398, 18433, 18513, 18514, 18515, 18559, 18824.
Seliger, H., 16070.
Sellers, C., 16249.
Selwyn-Clarke, S., 18995.
Semeraro, D., 16071.
Seneca, H., 16846, 18743.
Senise, N., 18744.
Sentic, M., 18936.
Senturia, B. H., 17701.
Sepchat, —., 18043.
Sérane, J., 16204.
Serpell, G., 18682.
Serra, C., 16025.
Serra, G. C., 17651.
Serrano, P., 17772.
Serrano, S., 18887.
Seth, H. N., 17099.
Settel, E., 17947.
Seulberger, P., 17513
Sewell, G., 17105.
Seymour, C. T., 17622.
Sfarcich, F., 17899.
Shackman, R., 17106.
Shafiro, I. B., 16661.
Shalowitz, M., 18864.
Shands, A. R., Jr., 16551.
Shao, H. H., 16001.
Shapiro, R. P., 17948.
Shapiro, S. K., 16890.
Sharpe, W., 17605
Shauklin, W. M., 17585.
Shaul, J. R., 16678.
Shay, H., 17597.
Shea, J., 15836.
Shearer, W. S., 16988.
Sheely, R. F., 16032.
Sheldon, J. H., 18825.
Shelton, E. K., 18434.
Shephard, A. H., 17976.
Shephard, R. J., 18323.
Sheps, J., 16334.
Shetlar, M. R., 16776.
Shibata, E., 18516.
Shibata, T., 18267.
Shiga, K., 18361, 18392.
Shimauchi, T., 18276, 18771.
Shimizu, G., 18683, 18684.
Shimizu, Sh., 18462, 18463.
Shimkin, M. B., 17451.
Shimoda, M., 18865.
Shimuzu, Sh., 18685.
Shindell, S., 16280, 17310.
Shinoto, K., 18203.
Shinozuka, A., 16634.
Shiozaki, T., 18617.
Shipley, R. E., 18324.
Shock, N. W., 15907, 15923, 16434, 16603, 16684, 17282, 17408, 17409, 18282.
Shore, I., 18676.
Short, J. J., 17470.
Shriber, W. J., 16891.
Shubin, H., 17696.
Shudde L., 17446.
Shurtleff, D., 18204.
Shuter, L. D., 17275.
Shutoku, J., 18423.
Sidi, E., 16218.
Siebenhaar, C., 17621.
Sigg, K., 16726.
Sigwald, J., 16033.
Sikes, D., 17013.
Silberberg, M., 15966, 15967, 17014.
Silberberg, R., 15966, 15967, 17014.
Silfverskiöld, N., 17052.
Siliato, F., 17652.
Silver, H. M., 15890.
Silverman, A. J., 16362.
Silverstone, F., 15890.
Silvestri, U., 17843, 17844.
Silving, H., 17311.
Sim, M., 17623.
Simeons, A. T. W., 17653.
Similon, A., 17857.
Simko, M. V., 18057.
Simnon, H. B., 17093.
Simonson, E., 15898, 15910, 18399.
Simonton, K. M., 16114.
Simpson, S. L., 16072
Sinclair, J. D., 16948, 16949.
Sinclair, R. J., 16158.
Sinclair-Smith, B. C., 16938.
Singer, M. I., 17552.
Sinha, P., 17163.
Sinkler, W. H., 17361.
Sinnege, J. L., 17602.
Sister Clement Raymond, 16552.
Sister M. Francine, 17135.
Sister Timothy Marie, 16552.
Sjögren, B., 15863.
Sjögren, H., 17136.
Skanse, B., 17586.
Skillicorn, S. A., 16892.
Sklar, M., 18464.
Sladden, R. J., 17805.
Slawson, R., 17134.
Slight, D., 17147.
Slocumb, C. H., 17058.
Slotkin, G. E., 17102.
Slotkin, J. S., 16499.
Sluzar, W. J., 18400, 18826.
Smart, T. B., 15909, 17556.
Smigel, J. O., 16238, 17537.
Smiley, J. R., 17176.
Smillie, W. G., 18874.
Smith, A. H., 16473.
Smith, C. A., 17175.
Smith, C. F., 18699.
Smith, C. S., 18539.
Smith, E. E. B., 15813.
Smith, E. M., 16156.
Smith, E. W., 16574.
Smith, H. W., 16635.
Smith, J. D., 18604.
Smith, L. A. 18501.
Smith, L. H., 17949.
Smith, L. W., 17053.
Smith, R. A., 18408.
Smith, R. C., 17893.
Smith, S. G., 16720.
Smith, T. L., 18088.
Smith, W. T., 17623
Smits, G., 16239.
Snedeker, L., 17299.
Snell, A. M., 15995.
Snyder, A. I., 17770.
Snyder, R. M., 19053.
Sobczyńska, B., 17031.
Sobel, H., 16777, 17580.
Society of Actuaries, 16335.
Soffietti, G., 15735.
Soki, K., 18772.
Sokol, J. K., 18797.
Sokoloff, L., 18492.
Sokolov, D. D., 17189.
Sokolow, J., 17624.
Sokolowski, A., 16855.
Solari, S., 16854.
Solez, C.,, 15899.
Sololov J., 18138.
Solomon, A., 19054.
Solon, J., 18827.
Somers, A. R., 18139.
Somers, H. M., 18139.
Sommer R. J., 16336
Sommerfeldt, H., 17107.
Sommers, S. C., 18407.
Somogyi, S., 17343.
Sonnefeld, A., 17716.
Soop, E., 18586.
Sordi, A., 18370.
Sørensen, L. B., 16751.
Sorensen, W. H., 17147.
Sorter, H., 17582.
Souplet, P., 16200.
Southwick, C. H., 15759.
Sovena, E., 16847.
Spagnoli, H. H., 15968.
Spain. Instituto Nacional de Estadística, 16406.
Speck, E., 18311.
Spencer, H., 18260.
Sperling, I. L., 17815.
Spicer, C. C., 15783.
Spies, H. A., Jr., 17054.
Spies, T. D., 17054.
Spinosa, A., 16099.
Spring, K., 16841.
Spurr, C. L., 16236.
Spurr, G. B., 15748.
Srivastava, S. P., 17872.
Stachurska-Torzecka, W., 17504.
Stadler, R., 17487.
Stähler, H., 17108.
Staffurth, J. S., 17540.
Stanchev, L., 16384.
Standeven, A., 17964.
Stannard, J. N., 16073.
Stapleton, J. F., 15928.

Stare, F. J., 15835, 15836, 17512.
Starr, I., 16773.
Starr, P., 17580.
Staubitz, W. J., 17109.
Stauffer, D., 17361.
Stearns, M. W., Jr., 15996.
Stecher, R. M., 16124, 17727, 17755.
Steckel, H. A., 17992.
Stecker, M. L., 16435.
Steel, R. C., 17502.
Steffen, C., 17015.
Steidle, R., 17654.
Steigmann, F., 16848.
Stein, I., 18745.
Steinach, E., 15844.
Steinberg, H. H., 18187.
Steinberg, I. H., 16186.
Steiner, P., 18949.
Steinman, M., 17547.
Stengel, F., 17289.
Stephen, C. R., 17655.
Stern, J., 18958.
Stevens, M., 16771.
Stevenson, I., 16317.
Steward, D. F., 18560.
Stewart, H. C., 17693.
Stichman, H. T., 17290.
Stickl, H., 15744.
Stiebel, P., 17055.
Stieglitz, E. J., 17137, 17879, 17993.
Still, J. W., 18300.
Stocks, P., 17177.
Stoddard, F. J., 17587, 17659.
Stokes, W., 18198.
Stoll, W. A., 16370.
Stolnitz, G. J., 17452, 18224.
Stolzer, B. L., 16179.
Stone, R. E., 17054.
Storla, C. A., Jr., 16460.
Storrs, R. C., 16056.
Story, J. B., 18686.
Stotsky, B. A., 17365.
Stout, A. P., 16230.
Strajman, E., 17539.
Straka, L., 16679, 17465.
Strandberg, B., 17816.
Strassmann, G. S., 15997, 17900.
Strauss, H., 16858, 18687.
Streib, G. F., 18058, 18978.
Streicher, E., 16034, 16074.
Strickland, S. C., 15859.
Strisower, B., 15861.
Ström, A., 17901.
Strong, L. C., 17410.
Strother, C. R., 16377, 16378.
Stubblefield, J. W., 17430.
Stubbs, R. D., 18426.
Stunkard, A. J., 16910.
Sturdevant, C. E., 17864.
Sturkie, P. D., 16746.
Süsse, H.-J., 16969.
Süttinger, H., 16752.
Sugai, M., 18524.
Sulgostowski, J., 15739.
Sulkin, N. M., 16612.
Sullivan, R. L., 18561.
Sumner, C. R., 18155.
Sumner, E. F. W., 16662.
Sunahara, M., 18635.
Super, D. E., 18979.
Suter, W. B., 17138.
Sutherland, D. A., 15855.
Sutton, C., 18766.
Suwa, N., 18391.
Suzue, K., 18401.
Suzuki, Sy., 18770.
Suzuki, T., 18354, 18772.
Svartz, N., 16161.
Swahn, B., 15866.
Swain, J. M., 18588.
Sweany, S. K., 18600.
Sweden. Statistiska Centralbyrån, 17466, 17467, 18017, 18937.
Swineford, O., Jr., 16194.
Switkes, H. I., 16259.
Switzer, M. E., 17259, 18140.
Switzerland. Eidgenössisches Statistisches Amt, 18248.
Switzerland. Eidgenössisches Statisches Amt. Bureau Fédéral de Statistique, 18938.
Switzerland. Union Bank, 16407.
Sykes, J. G., 17312.
Sylvest, O., 17133.
Szabó, D., 18403.
Szulc, G., 18269.

T

Tabah, L., 16616, 17232, 17313.
Tabata, M., 18587.
Tachi, M., 18249.
Tachibana, K., 18911, 18912, 19055.
Taeuber, I. B., 18588.
Tagawa, S., 18688.
Taietz, P., 18058.
Takagaki, T., 18772.
Takahashi, E., 16075, 18293.
Takahashi, K., 18709.
Takahashi, M., 18636.
Takahashi, Z., 18480.
Takano, R., 18805.
Takarai, T., 18613, 18614.
Takayama, Y., 18250.
Takayasu, H., 18798.
Takeuchi, Z., 17449.
Takeya, M., 18518.
Takimoto, I., 18589.
Takiuchi, A., 18828.
Talbott, J. H., 16205.
Tallent, N., 19015.
Talley, R. W., 16035.
Tamler, E., 17717.
Tamplin, A., 15861.
Tamura, A., 18371.
Tanaka, Ch., 18689.
Tanaka, K., 18806.
Tanaka, Sh., 18372.
Tănase, I., 18318, 18319.
Tannebaum, O., 17557.
Tarnopolsky, S., 17056.
Tauchi, H., 18465, 18517, 18518.
Taylor, C., 16379, 16380.
Taylor, H. L., 15910.
Taylor, J. N., 17110.
Taylor, K. B., 17846.
Taylor, W., 17468.
Taylor, W. N., 17110.
Taymor, M., 17669.
Teachers Insurance and Annuity Association. College Retirement Equities Fund, 18059.
Tedeschi, C. G., 17558.
Tedeschi, G., 15846.
Tegner, W., 17817.
Tenney S. M., 16950.
Terada, H., 16213.
Terashima, M., 18587.
Terman, L. A., 17178.
Terrell, J. C., 16663.
Tesar, J., 18148.
Teseo, L., 18557.
Teter, H. R., 16021.
Thaler, M., 16362.
Theodore A., 18637.
Thiers, H., 17818.
Thies, H. A., 15998.
Thiodet, J., 17774.
Thomas, A. E., 17775.
Thomas, A. J., 16756.
Thomas, D., 16189.
Thomas, D. P. P., 16162.
Thomas, R. R., 16381.
Thomasson, H. J., 15837.
Thomley, M. W., 18799.
Thompson, A. R., 18141.
Thompson, D. E., 17994, 18913.
Thompson, D. J., 16281, 16987.
Thompson, G. G., 16380.
Thompson, M., 16173.
Thompson, W. S., 18018.
Thorek, P., 18891.
Thorne, G. D., 17990.
Thresher, I. K., 17314.
Thulin, K. E., 17016.
Tibbitts, C., 16436, 17315, 17411.
Tickton, S. G., 19004.
Tietz, C., 19021.
Tillotson, C., 18478.
Tingaud, R., 17083.
Tisserand-Perrier, M., 16604.
Titmuss, R. M., 18980.
Tobin, R., 18800.
Todd, J. P., 17368.
Todhunter, E. N., 17478.
Töndury, G., 16970.
Törnquist, R., 16115.
Törnqvist, K., 16467.
Tokuomi, H., 18354.
Tomonaga, T., 18829.
Tompkins, D. G., 16474.
Tondeur, F., 16849.
Tongo, W. L., 17907.
Toniutti, M., 17845.
Toor, M., 15871.
Tophøj, E., 16190.
Torazza-Gazzera, M., 17840.
Torii, Sh., 18330.
Toronto. Unemployment Insurance Commission. National Employment Service. Adult Counsellors, 18914.
Toropova, G. P., 16685.
Torresini, A., 17139, 17185, 18992.
Toussaint, Jr., 18740.
Touster, O., 15856.
Townsend, R. O., 15818.
Toyokura, Y., 18480, 18668, 18824.
Trabucco, A., 18477.
Trantham, K. S., 15764, 18884.
Trapido, H., 17431.
Traut, E. F., 18746.
Treanor, W. J., 18519.
Trifilio, A, 16230.
Trinidad and Tobago. Central Statistical Office, 16680.
Troccoli, B., 16747.
Troger, E., 18019.
Trompeo, G., 16051.
Tronche, P., 18679.
Trowell, H. C., 16694.
Truc, E., 17111, 17112.
Trüb, C. L. P., 17158.
Truelove, S. C., 18441
Truet, J., 16036.
Trulson, M. F., 16693, 17643, 17733.
Truscott, B. L., 15992, 18325.
Trussell, R. E., 18866.
Tsubaki, T., 18480, 18520, 18521, 18668, 18848, 18859, 18867.
Tsuboi, K. K., 17860.
Tsujiyama, Y., 18690.
Tuba, J., 16052.
Tubaki, T., 18522.
Tuckman, J., 17985.
Tuft, L., 16217, 16911.
Tunbridge, R. E., 15930, 17562.
Tupper, C. J., 17882.
Turkey, Istatistik Umum Müdürlügü, 17233.
Turmel, J., 16876.
Turner, H., 19056.
Turner, R., 17793, 17850.
Tutt, L. W. G., 16681.
Tuzi, T., 17764.
Tysebaert, J., 16553.
Tzanck, A., 16218.

U

Uchida, H., 18638.
Ujiie, K., 18291.
Umar, S., 17370.
Unger, L., 16959, 18562.
Unglaub, W. G., 15826.
United Nations. Department of Economic and Social Affairs. Population Division, 17234.
United Nations. Department of Economic and Social Affairs. Statistical Office, 17235.
United Nations. Economic and Social Council. Commission on the Status of Women, 16440.
United Nations. General Assembly. Committee on Information from the Non-Self Governing Territories, 16664.
United Nations. Population Branch, 18020.
United Nations. Statistical Office, 15804.
U. S. Board of Trustees of the Federal Old-Age and Survivors Insurance Trust Fund, 16519.
U. S. Bureau of the Census, 16408, 16926, 17237, 17260, 17323, 17675, 18021, 18022, 18939.
U. S. Congress. House. Committee on Ways and Means, 17276, 17344.
U. S. Congress. Joint Committee on the Economic Report, 18023.
U. S. Congress. Joint Committee on Railroad Retirement Legislation, 18950.
U. S. Congress. Senate. Committee on Banking and Currency. Subcommittee on Housing, 18996.
U. S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Welfare and Pension Funds, 18981.
U. S. Department of Agriculture, 18972.
U. S. Department of Agriculture. Agricultural Marketing Service, 18982.
U. S. Department of Health, Education and Welfare, 16520.
U. S. Department of Health, Education and Welfare. Committee on Aging, 16605.
U. S. Department of Health, Education and Welfare. Public Health Service, 17457, 18830, 19005, 19088.
U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics, 15784, 15785, 15786, 15787, 15788, 15789, 15790, 16387, 16665, 16666, 16667, 16927, 17453, 17454, 17455, 17456, 18205, 18225, 18226, 18227, 18228, 18229, 18230, 18231, 18232, 18233, 18234, 18235, 18590, 18940.
U. S. Department of Health, Education and Welfare. Public Health Service. Division of Hospital and Medical Facilities, 18831.
U. S. Department of Health, Education and Welfare. Social Security Administration, 16437, 16438, 17261, 18044, 18045, 18046, 18105, 18106, 18951, 18959, 18983, 19006, 19034, 19035, 19036, 19037.
U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance, 18107, 18108.

U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Public Assistance, 19033, 19038.
U. S. Department of Labor. Bureau of Employment Security, 18960, 18961, 18962.
U. S. Department of Labor. Bureau of Labor Statistics, 18952.
U. S. Department of Labor. Women's Bureau, 16439, 18963, 18964.
U. S. Housing and Home Finance Agency, 18997.
U. S. Office of Defense Mobilization. Health Resources Advisory Committee, 19057.
University of Denver. Bureau of Business and Social Research, 18998.
University of Michigan. Conference on Aging, 16606.
University of Nebraska. Council for Community Study, 17236.
Upchurch, W. E., 17864.
Uribe, C. R., 18431.
Ushiyama, K., 18757.
Usov, A. G., 17203.

V

Vacca, C., 16475.
Vaccà-Berlinghieri, F., 19080.
Vainio, K. J., 17001, 17002, 17804.
Valentin, H., 18563.
Valle, F., 16099.
Valle, G., 18591.
Van Andel-Ripke, O., 16828.
Van Buskirk, C., 16037.
Van Demark, G. E., 16139.
Van Demark, R. E., 16139.
Van Demark, W. E., 16139.
van den Hooff, A., 16239.
Van der Laan, A. F., 17238.
Van der Lugt, P., 17345.
Van der Straeten, P. P., 15900.
Van Moorleghem, G., 16994.
Van Slyke, F., 16058.
Vanstone, W. E., 17514.
Van Thiel, H., 15999.
Van Wagenen, G., 18325.
Van Zonneveld, R. J., 16282, 16283, 17412, 18965.
van Zyl, A., 18326.
Varchaver, C., 19016.
Varnier, M., 18808.
Vartia, K. O., 16044.
Vaschide, N., 18691.
Vattuone, G., 18523.
Vaugelade, —., 17143.
Vaughan, D. G., Jr., 17588.
Vaughan, J. H., 18732.
Vaughan, J. M., 17498.
Vaughn, A. M., 18892.
Vaughn, R., 17269.
Vecchi, V., 18701.
Veckl, V. G., 17204.
Vega Diaz, F., 15737, 15901.
Venezuela. Dirección General de Estadística y de Censos Nacionales, 16409.
Venrath, H., 18563.
Venzmer, G., 15969.
Veraguth, P. C., 16140.
Verdelja, N., 16038.
Verdonk, G., 15838.
Vergani, L., 15895, 16468.
Vernant, P., 15927.
Vernin, C. S., 18146.
Veronesi, U., 16928.
Versluys, J. J., 16929.
Verzár, F., 16778, 16829, 17084.
Vesell, H., 17557.
Vesfamil'Naia, Z. I., 18466.
Vetter, A., 16382.
Vickery, F. E., 19058.
Victoria Preto, —., 15963.
Viel, B., 15805.
Vignon, G., 17818.
Villa, L., 17057, 17819.
Villiaumey, J., 16147.
Vincent, P. E., 15791, 18024.
Vine, S. M., 16284.
Vinicius da Rocha, M., 15806.
Viola, S., 18370.
Viollet, G., 18571.
Vischer, A. L., 16370, 16609.
Vishnevskii, Iu. B., 15872.
Visscher, M. B., 15829, 17373.
Vivrett, W. K., 18999, 19000.
Vlahovitch, B., 16871.
Vogel, M., 18210.
Vogt, O., 16893.
Voit, K., 18731.
Von Hellens, A., 17113.
von Herrenschwand, F., 16117.
von Keyserlingk, H., 17625.
von Mallinckrodt, H., 18563.
Von Mikulicz-Radecki, E. 17589.
Von Pap, L., 16191.
Von Plotho, B., 18327.
von Verschuer, O. F., 16617.
Vosburgh, L. F., 17577.
Vouras, M, 16141.

W

Wachs, M., 19059.
Wada, M., 18772.
Wade, B. G., 16554.
Wager, O., 17776.
Wagner, A., 16686
Wagner, H., 18435.
Wagner, R., 16003, 16774.
Wagner, V., 17777.
Wagoner, G., 17420.
Wahl, A., 16555, 18142.
Wahlgren, F., 16145.
Wainwright, C. W., 17778.
Wakeley, C., 17598.
Walker, G. R., 17485.
Walker, W. J., 16775.
Wallace, W. L., 16365, 17972.
Waller, E. F., 18715.
Waller, M. V., 18732.
Walsh, P., 18823.
Walters, T. A., 16039.
Walthard, K. M., 17779.
Wambergue, G., 16476.
Wantz, G., 16850.
Warbasse, J. P., 16457.
Ward, G. E., 17539.
Ward, J. K., 16337.
Ward, L. E., 16192, 17058.
Ward-Dunn, G., 17157.
Warnecke, C. E., 17114.
Warnick, K. P., 15860.
Warren, J. E., 16987.
Warren, J. V., 17078.
Warren, M., 16285, 16293.
Warren, P. K. G., 16873, 17524.
Warter, P. J., 16193, 18747.
Washington. Governor's Council for Aging Population, 16500, 16501.
Wasserman, F., 17550.
Watanabe, H., 18611.
Watanabe, J., 18206.
Watanabe, K., 18467.
Watanabe, M., 18537, 18710.
Watanabe, S., 18236, 18251.
Watkins, E. G., 16556.
Watne, A. L., 16830.
Watson, D., 16998.
Wayburn, E., 18868.
Webber, I. L., 15738, 16502, 18941.
Weberitsch, W., 17950.
Webster, D., 16037.
Wechsler, D., 17995.
Wechsler, I. S., 16040.
Weed, J. C., 18582.
Wehmeyer, P., 16721, 16722.
Wehner, G., 16960.
Weil, P. G., 16596.
Weinberg, D., 19081.
Weinberg, F., 16319.
Weinberg, M., 18711.
Weiner, L., 15792.
Weinstein, L., 18120.
Weir, M. M., 16173.
Weisenfeld, S., 17682.
Weismann-Netter, R., 17059.
Weiss, H. S., 16746.
Weiss, M. M., 17559.
Weiss, P., 17626.
Weissman, F., 16878.
Welfare and Health Council of New York City. Research Department, 18089.
Wellwood, L., 16669.
Welsh, P. P., 15928.
Wenig, P. W., 17147.
Wensley, E., 17806.
Werner, S. C., 16076.
Wertheim, A., 18468.
Wertheim, W. F., 16410.
Weskott, H., 17769.
West, H. F., 18426. 1
Westendorp Boerma, F., 17017.
Westergren, A., 17780.
Westlund, K., 16912.
Weston, R. E., 18270.
Westphal, K. H., 16668.
Wetchler, B., 17577.
Whedon, G. D., 18712.
Whettenhall, J. P., 17277.
White, A., 18271.
White, E. B., 18156.
White, J. D., 18795.
White, M. S., 18892.
White, P. D., 17374
Whitlock, J. H., 17432.
Whitmore, W. F., Jr., 17873.
Wibaux, R., 16477.
Wickens, P. C., 16672.
Wickwire, G. C., 17366.
Widdowson, E. M., 16690.
Widstam, T., 17239.
Wiecha, D., 15749.
Wieme, R., 18645.
Wigzell, F. W., 16158.
Wilde, H., 15921.
Wilder, D., 17584.
Wilder, V. M., 18314.
Williams, G. D., 18065.
Williams, H. H., 17502.
Williams, R. J., 18292.
Williamson, L. C., 18966.
Wilson, A. O., 17106.
Wilson, D. C., 16383.
Wilson, F. M., 17186.
Wilson, H., 16831.
Wilson, R. H., 18604.
Wilson, T. S., 18564.
Winfield, G. A., 16669.
Wing, M. N., 16557.
Winkler, W., 17240.
Winn., J. M., 16974.
Winnipeg, Canada. Committee on Services for the Aged, 19017.
Winslow, M. B., 17741.
Winters, L. M., 16079.
Wintrobe, M. M., 17492.
Wirecki, M., 18878.
Witt, J. A., 15970.
Witte, E. E., 17346.
Wittmer, F., 17347.
Wolanski, A., 17571.
Wolfe, H. R., 17656.
Wolff, J. R., 17662.
Wolff, K., 18869.
Wolfrom, H. M., 16832.
Wolfson, W. Q., 16164.
Wollenberger, A., 16077.
Womack, R. K., 17874.
Wood, M. J., 15930, 17562.
Wood, R., 17500.
Woodard, H. Q., 17873.
Woodmansey, A., 17781.
Woodruff, J. D., 15971.
Woods, E., 15860.
Wool, H., 18047.
Woolner, L. B., 18424.
Woratz, G., 18748.
World Health Organization, 15793, 15807, 16682.
Wormley, L. C., 17875.
Wornom, P. H., 16194.
Worrall, R. L., 15843.
Wrenshall, G. A., 15972.
Wright, G. W., 18630.
Wright, I. S., 17627.
Wright, K. W., 16833.
Wright, L. D., 15859.
Wünscher, W., 16894.
Wulkan, E., 17582.
Wyrsch, J., 16370.
Wyss, F., 18607.

Y

Yagi, Y., 18469, 18593.
Yakawa, M., 18259, 18272, 18273, 18328.
Yamada, K., 18402.
Yamada, Ry., 18479.
Yamaguchi, M., 18646.
Yamamoto, S., 17449.
Yamanaka, K., 18274, 18470, 18773.
Yamaura, A., 18188.
Yamazaki, M., 18252.
Yanagi, K., 18253.
Yao, S., 18471.
Yarbro, M. C., 15856.
Yarrow, M. W., 17740.
Yasozima, S., 18524.
Yasui, S., 18594.
Yasuzawa, K., 18565.
Yates, F. E., 16711.
Yates, W. M., 15928.
Yavorsky, M., 17421.
Yeoman, W., 16195.
Yeracaris, C. A., 18237.
Yerby, A. S., 18143.
Yntema, L., 17241.
Yakota, H., 18253.
Yokota, T., 15760.
Yoshida, S., 16095, 16096.
Yoshida, T., 18472, 18473, 18566.
Yoshikawa, E., 18695, 18700.
Yoshikawa, S., 18673.
Yoshikawa, Sh., 18662.
Yoshimura, H., 18373, 18546.
Yoshimura, M., 18695.
Young, R. H., 19018.
Young, R. J., 16624.
Yting, H., 16834.
Yuasa, Y., 18203.
Yuwamoto, M., 18757.

Z

Zabielska, J., 17011.
Zacco, M., 16835, 17060, 17071.
Zahorska, A., 15873.
Zalesskii, G. D., 16165.
Zappia, A., 17592.
Zavaleta Zavaleta, O., 17515.
Zekhnov, M. I., 15761.
Zeman, F. D., 16286, 18832.
Zhilinskaia, M. A., 16041.
Ziehen, V., 17179.
Ziff, M., 18749.
Ziffren, S. E., 17732.
Zintel, H. A., 17965.
Zisserman, L., 17499.
Zöllner, N., 16102.
Zoku, M., 18692.
Zorzoli, A., 18189.
Zubiani, A., 15845.
Zucker, M., 17822.
Zuckerman, S., 17728.
Zuckner, J., 17782.
Zülch, K. J., 16042, 18144.
Zukel, W. J., 18238.
Zurakowski, S., 18297.
Zykova, Z. I., 16338.

Index to Volume 11

The page numbers of all original articles published in the JOURNAL OF GERONTOLOGY are set in bold face type.

A

ANDREW, N. V.—(See Andrew, W.)

ANDREW, W.—and N. V. Andrew. An Age Difference in Proportions of Cell Types in the Epidermis of Abdominal Skin of the Rat. **18.**

AUTHOR INDEX TO CURRENT PERIODICAL LITERATURE—N. W. Shock. 487.

B

BALÓ, J.—(See Banga, I.)

BANFIELD, W. G.—Age Changes in the Swelling Capacity of Human Achilles Tendon. **372.**

BANGA, I.—J. Baló, and D. Szabó. Metacollagen as the Apparent Elastin. **242.**

BERG, B. N.—Muscular Dystrophy in Aging Rats. **134.**

BOOKS RECEIVED—91, 176, 206, 308, 338, 402, 426.

BOOK REVIEWS—

Biology of Senescence, by A. Comfort (J. E. Kirk). 307.
Buildings for the Aging, a symposium reprinted from the *Architectural Record* (C. Tibbitts). 425.
Charter for the Aging, Report on the New York State Conference on Problems of the Aging (W. H. Reals). 338.
Cost of Medical Care for the Aged, by G. H. Houck, O. Nielson, and C. W. Churchill (D. Littauer). 90.
Dynamics of Aging, by E. S. Smith (C. Tibbitts). 425.
Earning Opportunities for Older Workers, edited by W. Donahue (C. Cronemeyer). 91.
Fields of Group Psychotherapy, edited by S. R. Slavson (I. N. Mensh). 176.
Geriatri, by S. Eckerström and T. Geill (J. E. Kirk), 308.
Josiah Macy, Jr. Foundation (E. V. Cowdry). 90.
Management of Pain in Cancer, by M. J. Schiffren (M. H. Lepper). 402.
Manual of Organization—Clubs for Senior Citizens (M. Rogers). 425.
Mental Disorders in Later Life, 2nd ed., edited by O. J. Kaplan (I. N. Mensh). 307.
Planning New Institutional Facilities for Long Term Care, by E. Nicholson (D. Littauer). 206.
Précis de Gérontologie, edited by L. Binet and F. Bourlière (R. Schaus). 175.
Recreation for the Aging in North Carolina (M. Rogers). 425.
Recreation for Later Maturity (M. Rogers). 425.
States and Their Older Citizens (W. H. Reals). 91.

BORTZ, E. L.—(See Brown, C. E.)

BOWSER, L. J.—(See Hayes, O. B.)

BROMLEY, D. B.—Some Experimental Tests of the Effect of Age on Creative Intellectual Output. **74.**

BROWN, C. E.—T. C. Huang, E. L. Bortz, and C. M. McCay. Observations on Blood Vessels and Exercise. **292.**

BRUCH, E.—Gerontological Activities in Germany. 216.

C

CAMERON, D. B.—(See Chinn, A. B.)

CHERNIKOFF, T.—(See Kleiber, M.)

CHINN, A. B.—P. S. Lavik, and D. B. Cameron. Measurement of Protein Digestion and Absorption in Aged Persons by a Test Meal of I^{131} Labeled Protein. **151.**

CHOW, B. F.—R. Wood, A. Horonick, and K. Okuda. Agewise Variation of Vitamin B_{12} Serum Levels. **142.**

CLAY, H. M.—An Age Difficulty in Separating Spatially Contiguous Data. **318.**

—A Study of Performance in Relation to Age at Two Printing Works. **417.**

COHEN, W. J.—The Role of Welfare Agencies in Providing Services to the Aged: The Role of the Public Agency. **328.**

D

DENNIS, W.—Age and Achievement: A Critique. 331.

DONAHUE, W.—Psychologic Research Needs in Gerontology. **196.**

DYRBYE, M.—and J. E. Kirk. The Beta-Glucuronidase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages. **33.**

DYRBYE, M.—(See Kirk, J. E.)

E

ESKRIDGE, J. B., III—(See Hellbaum, A. A.)

F

FALZONE, J. A., Jr.—(See Norris, A. H.)

FELLOWS AND MEMBERS OF THE GERONTOLOGICAL SOCIETY, INC. 451.

FLEETWOOD, J. F.—Gerontological Activities in Ireland. 213.

FORD, T. R.—(See McMahan, C. A.)

FRAENKEL, M.—Conditions of Aged Hospital Patients. **192.**

FREYDBERG, V.—(See Verzár, F.)

FRIEDMAN, C. L.—(See Friedman, S. M.)

FRIEDMAN, S. M.—J. A. M. Hinke and C. L. Friedman. Neurohypophyseal Responsiveness in the Normal and Senescent Rat. **286.**

G

Geiringer, E.—Young Rats with Adult Adrenal Transplants: A Physiologic Study. **8.**

GERIATIC PRACTICE—301, 397.

GORDON, A. S.—(See Padawer, J.)

H

HARMAN, D.—Aging: A Theory Based on Free Radical and Radiation Chemistry. **298.**

HAYES, O. B.—L. J. Bowser, and M. F. Trulson. Relation of Dietary Intake to Bone Fragility in the Aged. **154.**

HEGLIN, H. J.—Problem Solving Set in Different Age Groups. **310.**

HELLBAUM, A. A.—J. B. Eskridge III, and R. W. Payne. The Influence of Pituitary Factors on Menopausal Vasomotor Instability. **58.**

HINKE, J. A. M.—(See Friedman, S. M.)

HORONICK, A.—(See Chow, B. F.)

HOSMER, C. L.—Retirement and Life Expectancy. 204.

HOWELL, T. H.—Urinary Excretion After the Age of Ninety. A Study of Neutral 17-Ketosteroids, Creatinine, and Creatine. **61.**

HUANG, T. C.—(See Brown, C. E.)

I

INDEX TO CURRENT PERIODICAL LITERATURE—N. W. Shock, 94, 217, 340, 459.

J

JUSTISS, W. A.—(See Kleemeier, R. W.)

K

KING, H. F.—An Attempt to Use Production Data in the Study of Age and Performance. **410.**

KING, J. T.—(See Lee, Y. C. P.)

KIRK, J. E.—and M. Dyrbye. Hexosamine and Acid-Hydrolyzable Sulfate Concentrations of the Aorta and Pulmonary Artery in Individuals of Various Ages. **273.**

—The Phenolsulfatase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages. **129.**

—and L. B. Sørensen. The Aldolase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages. **373.**

(Also see Dyrbye, M., Schaus, R., and Sørensen, L. B.)

KLEEMEIER, R. W.—T. A. Rich, and W. A. Justiss. The Effects of Alpha-(2-Piperidyl) Benzhydrol Hydrochloride (Meratran) on Psychomotor Performance in a Group of Aged Males. **165.**

KLEIBER, M.—and T. Chernikoff. Metabolic Rate of Old Rats and Spontaneous Breast Tumors. **140.**

KORENCHEVSKY, V.—Treatment of Senescent Male Rats with Cortisone Acetate Alone or Together with Sex and Thyroid Hormones. **261.**

KUMNICK, L. S.—Aging and Decay of Pupillary Psychosensory Restitution. **46.**

—Aging and Pupillary Response to Light and Sound Stimuli. **38.**

—Aging and the Efficiency of the Pupillary Mechanism. **160.**

—Aging and the Latency and Duration of Pupil Constriction in Response to Light and Sound Stimuli. **391.**

L

LANDOWNE, M.—(See Norris, A. H.)

LAVIK, P. S.—(See Chinn, A. B.)

LEE, Y. C. P.—M. B. Visscher, and J. T. King. Life Span and Causes of Death in Inbred Mice in Relation to Diet. **364.**

LEHMAN, H. C.—Reply to Dennis' Critique of Age and Achievement. 333.

LEPKOWSKI, J. R.—The Attitude and Adjustments of Institutionalized and Non-Institutionalized Catholic Aged. **185.**

LUND, E.—and O. Sylvest. Occurrence of Resistant *Staphylococci* in an Institution for the Aged in Copenhagen. **83.**

LYONS, J. S.—and M. F. Trulson. Food Practices of Older People Living at Home. **66.**

M

MCCAY, C. M.—(See Brown, C. E.)

MCMAHAN, C. A.—and T. R. Ford. Rejoinder to Retirement and Life Expectancy. 205.

MARMORSTON, J.—(See Sobel, H.)

N

NORRIS, A. H.—N. W. Shock, M. Landowne, and J. A. Falzone, Jr.—Pulmonary Function Studies. Age Differences in Lung Volumes and Bellows Function. **379.**

O

OKUDA, K.—(See Chow, B. F.)

ORGANIZATION SECTION—208, 428.

P

PADAWER, J.—and A. S. Gordon. Peritoneal Fluid Mast Cells: Their Numbers and Morphology in Rats of Various Body Weights (Ages). **268.**

PAYNE, R. W.—(See Hellbaum, A. A.)

POLLAK, O. J.—Serum Elpherograms in Rabbits on Lipid Diets. I. Cottonseed Oil, Cholesterol, or Cholesterol in Oil. **120.** II. Cottonseed Oil, Cholesterol, or Cholesterol in Oil, Combined with Pancreatin Feedings in Intact and in Partially Depancreatized Rabbits. **125.**

R

REPORTS FROM FOREIGN CORRESPONDENTS, 213.

RICH, T. A.—(See Kleemeier, R. W.)

ROCKSTEIN, M.—Some Biochemical Aspects of Aging in Insects. **282.**

S

SANDELIUS, G.—Ninety-nine - Year - Old Monozygotic Twins. **171.**

SCHAUS, R.—Gerontological Activities in the Grand Duchy of Luxembourg. **214.**

—and J. E. Kirk. The Riboflavin Concentration of Brain, Heart, and Skeletal Muscle in Individuals of Various Ages. **147.**

SCHROEDER, H.—Geriatric Practice: The Control of Arterial Hypertension in Older Individuals. **397.**

SHOCK, N. W.—Index to Current Periodical Literature. 94, 217, 340, 459.

Author Index, 487.

(Also see Norris, A. H. and Stoloff, I.)

SOBEL, H.—and J. MARMORSTON. The Possible Role of the Gel-Fiber Ratio of Connective Tissue in the Aging Process. **2.**

SOMMERS, S. C.—Basement Membranes, Ground Substance, and Lymphocytic Aggregates in Aging. **251.**

SØRENSEN, L. B.—and J. E. Kirk. Variation with Age in the Fumarase Activity of Human Aortic and Pulmonary Artery Tissue. **28.**

(Also see Kirk, J. E.)

STOLOFF, I.—D. M. Watkin, and N. W. Shock. Age and the Ratio T_mPAH/T_m Diodrast in Man with a Note on the Self-Depression of T_m Diodrast. **388.**

STRÖM, A.—An Investigation of the Living Conditions and Health of 1389 Persons Aged 70 Years or More in Norway. **178.**

SYLVEST, O.—(See Lund, E.)

T

THALER, M.—Relationships Among Wechsler, Weigl, Rorschach, EEG Findings, and Abstract-Concrete Behavior in a Group of Normal Aged Subjects. **404.**

TRULSON, M. F.—(See Hayes, O. B., and Lyons, J. S.)

V

VAN ZONNEVELD, R. J.—Gerontological Activities in the Netherlands. 213.

VERZÁR, F.—and V. Freydberg. Changes of T Activity in the Rat in Old Age. **53.**

VISSCHER, M. B.—(See Lee, Y. C. P.)

W

WATKIN, D. M.—(See Stoloff, I.)

WEBBER, I. L.—The Effect of Migration on the Number and Distribution of the Aged in Florida. **323.**

WEED, J. C.—Geriatric Practice: Geriatric Office Gynecology. **301.**

WOOD, R.—(See Chow, B. F.)

DOES NOT CIRCULATE
UNIVERSITY OF MICHIGAN
OCT 30 1956
MEDICAL LIBRARY

Volume 11 AUTUMN No. 4

JOURNAL of GERONTOLOGY

To add life to years, not just years to life

OCTOBER, 1956

Life Span and Causes of Death in Inbred Mice in Relation to Diet ---------- *Y. C. P. Lee, M. B. Visscher, and J. T. King*

Age Changes in the Swelling Capacity of Human Achilles Tendon---------- *W. G. Banfield*

The Aldolase Activity of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages---------- *J. E. Kirk and L. B. Sørensen*

Pulmonary Function Studies: Age Differences in Lung Volumes and Bellows Function ---------- *A. H. Norris, N. W. Shock, M. Landowne, and J. A. Falzone, Jr.*

Age and the Ratio T_m PAH/T_m Diodrast in Man with a Note on the Self-Depression of T_m Diodrast---------- *I. Stoloff, D. M. Watkin, and N. W. Shock*

Aging and the Latency and Duration of Pupil Constriction in Response to Light and Sound Stimuli---------- *L. S. Kumnick*

Geriatric Practice: The Control of Arterial Hypertension in Older Individuals----- *H. A. Schroeder*

Relationships Among Wechsler, Weigl, Rorschach, EEG Findings, and Abstract-Concrete Behavior in a Group of Normal Aged Subjects---------- *M. Thaler*

An Attempt to Use Production Data in the Study of Age and Performance---------- *H. F. King*

A Study of Performance in Relation to Age at Two Printing Works---------- *H. M. Clay*

PROGRAM OF THE NINTH ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. AND ABSTRACTS OF PAPERS TO BE PRESENTED, CHICAGO, ILLINOIS, NOVEMBER 8-10, 1956

Published Quarterly by
THE GERONTOLOGICAL SOCIETY, INC.

EDITORIAL STAFF
GERONTOLOGICAL SOCIETY, INC.

EDITORIAL BOARD

ROBERT A. MOORE, *Chairman*
Pittsburgh

ERNEST W. BURGESS
Chicago

ROY G. HOSKINS
Boston

HAROLD E. JONES
Berkeley

EDITORS, JOURNAL OF GERONTOLOGY

JOHN ESBEN KIRK, *Editor-in-Chief*
NATHAN W. SHOCK, *Assistant Editor*
MARJORIE ADLER, *Assistant to the Editor*

CONSULTANTS TO THE EDITORS

For the Natural Sciences
E. V. COWDRY, Washington University

For the Social Sciences
H. G. MOULTON, Brookings Institution

For the Humanities
RICHARD F. JONES, Stanford University

FOREIGN CORRESPONDENTS

Correspondent for Argentina
B. A. HOUSSAY, Buenos Aires

Correspondent for Canada
R. I. MACDONALD, Toronto

Correspondent for Denmark
T. GEILL, Copenhagen

Correspondent for Finland
E. JALAVISTO, Helsinki

Correspondent for France
F. BOURLIÈRE, Paris

Correspondent for the Grand Duchy of Luxembourg
R. SCHAUS, Luxembourg

Correspondent for Great Britain
V. KORENCHEVSKY, London

Correspondent for Ireland
J. F. FLEETWOOD, Dublin

Correspondent for Italy
G. MARS, Milan

Correspondent for Mexico
E. AGUIRRE PEQUEÑO, Monterrey

Correspondent for the Netherlands
R. J. VAN ZONNEVELD

Correspondent for South Australia
O. W. FREWIN, Adelaide

Correspondent for Spain
F. VEGA DIAZ, Madrid

Correspondent for Sweden
E. ECKERSTRÖM, Gothenburg

Correspondent for Uruguay
J. M. SOSA, Montevideo

EDITOR, NEWSLETTER

OSCAR J. KAPLAN, *San Diego, California*

ADVISORY EDITORIAL BOARD

W. M. ALLEN, Obstetrics and Gynecology
Washington University
BERT G. ANDERSON, Dentistry
Yale University
DAVID P. BARR, Internal Medicine
Cornell University
JAMES E. BIRREN, Psychology
National Institute of Mental Health
E. M. BLUESTONE, Hospital Administration
Montefiore Hospital
D. E. CAMERON, Psychiatry
McGill University
A. J. CARLSON, Physiology
University of Chicago
F. STUART CHAPIN, Sociology
University of Minnesota
MARGARET CHIEFFI, Internal Medicine
St. Louis, Missouri
W. H. FELDMAN, Veterinary Medicine
Mayo Foundation
J. S. FRIEDENWALD, Ophthalmology
Johns Hopkins University
A. C. FURSTENBERG, Otolaryngology
University of Michigan
WILLIAM M. GAFAFER, Biostatistics
United States Public Health Service
E. C. HAMBLEN, Endocrinology
Duke University
FRANK HANKINS, Sociology
Smith College
FRANK HINMAN, Urology
University of California
FREDERICK L. HISAW, Zoology
Harvard University
OSCAR J. KAPLAN, Psychology
San Diego State College
FORREST E. LINDER, Statistics
Bureau of the Census
IRVING LORGE, Psychology
Teachers College, Columbia University
C. M. McCAY, Nutrition
Cornell University
WILLIAM MUHLBERG, Insurance Medicine
Union Central Life Insurance Co.
WINFRED OVERHOLSER, Psychiatry
St. Elizabeths Hospital
OLLIE RANDALL, Social Work
Community Service Society of New York
R. REDFIELD, Anthropology
University of Chicago
PEYTON ROUS, Oncology
Rockefeller Institute for Medical Research
HENRY SIMMS, Biochemistry
Columbia University
OWEN H. WANGENSTEEN, Surgery
University of Minnesota
ARNOLD WELCH, Pharmacology
Western Reserve University
PAUL D. WHITE, Cardiology
Massachusetts General Hospital
W. R. WILLIAMSON, Actuarial Science
Wyatt Company, Washington, D.C.

N

D

The rising interest in problems of aging emphasizes the need for interdisciplinary communication. The Gerontological Society is a national organization dedicated to promoting the scientific study of the aging process, disseminating information about aging, and providing a common meeting ground for representatives of all groups interested in aging people.

The Society invites all Members and Fellows to recommend for Membership, colleagues and friends who have an interest in any aspect of aging. Please send names and addresses of potential new members to the Secretary, Nathan W. Shock, Gerontology Branch, Baltimore City Hospitals, Baltimore 24, Maryland, or to the Chairman of the Membership Committee, Joseph T. Freeman, M.D., 1530 Locust Street, Philadelphia 2, Pennsylvania.

Joseph T. Freeman, M.D.,
Chairman, Membership Committee

APPLICATION FOR MEMBERSHIP IN THE GERONTOLOGICAL SOCIETY, INC.

..... Membership*, including subscription to Journal of Gerontology and the Newsletter (Annual dues $10.00).

..... Membership, without subscription to Journal of Gerontology. Includes subscription to Newsletter (Annual dues $2.50).

* If you wish to be considered for Fellowship status—check here ☐

Nominated by:

.....

.....

Name .....
(Please print)

Title .....

Organization .....

.....

Address .....

.....

Date .....

(Make checks or money orders payable to the Gerontological Society, Inc., and mail with applications to N. W. Shock, Secretary, Baltimore City Hospitals, Baltimore 24, Maryland).

To members and Fellows: Lists of those whom you consider eligible for Membership or Fellowship may be sent on your own stationery directly to the Secretary or Chairman of the Membership Committee.

Aesku
Hall,
Basel
G. H
F. Ki
dam
R. B
derla
hage
– G.
Berli
zár,
G. G
Cros
R. B
K. F

ymposium on experimental research on ageing

Basel (Switzerland), April 4th-7th, 1956

Experientia Supplementum IV
Editor Prof. F. Verzár, University of Basel
Ca. 350 pp. Swiss Francs 34.–($8.10)

Contents: Lectures held at the Symposium.
Authors: L. Brull and C. Keil, Liège – R. E. Tunbridge, Leeds – D. A. Hall, Leeds – I. Banga, J. Baló and D. Szabó, Budapest – F. Verzár, Basel – N. R. Joseph and F. Bourlière, Paris – J. F. Danielli, London – G. H. Bourne, London – L. Haranghy, P. Rácz, E. Hársfalvy and F. Király, Budapest – F. H. Schulz, Leipzig – P. J. Thung, Amsterdam – F. Hügin and F. Verzár, Basel – V. Korenchevsky, London – R. B. Fisher, Oxford – O. Olbrich and E. Woodford-Williams, Sunderland – J. A. Huet, Paris – G. Di Macco, Torino – T. Geill, Kopenhagen – W. J. E. Jessop, Dublin – H. Baur, Basel – J. Nöcker, Leipzig – G. Schettler, Marburg – L. v. d. Horst, Amsterdam – J. A. Schneider, Berlin – W. Schulze, Ludwigshafen – V. Freydberg-Lucas and F. Verzár, Basel – J. Rechenberger, Leipzig – E. Greppi, G. Scardigli and G. Guidi, Firenze – M. Bürger, Leipzig – P. Divry, Liège – E. R. F. W. Crossman and J. Szafran, Birmingham – A. T. Welford, Cambridge – R. Brückner, O. Gsell, F. Hügin, E. Batschelet and F. Verzár, Basel – K. Fleischer, Leipzig – H. Ludwig, Basel – O. Mühlbock, Amsterdam – F. M. Antonio, Firenze.

Please order through your Bookseller or directly from

Birkhauser Publishers, Basel

(Switzerland)

Announcing—

FIVE HUNDRED OVER SIXTY

A Community Survey of Aging

By

Bernard Kutner, David Fanshel, Alice M. Togo, Thomas S. Langner

Reports personal interviews with 500 individuals sixty years of age or over residing in Kips Bay-Yorkville section of New York City. Considers the older person's adjustment in relation to marital status, employment, activity level, and degree of isolation. Analyzes the health status, use of community health resources, and attitudes toward the use of such facilities. Examines programs and trends in services for the aged in New York City. Includes 87 tables.

6 x 9 345 pp. 1956 $4.00

RUSSELL SAGE FOUNDATION
505 Park Avenue New York 22, N.Y.

Notice

The four issues of 1951 and the January, 1952, issue of the Journal of Gerontology are now out of print. The Journal of Gerontology will be glad to purchase copies of these issues which are in good condition for $3.50; issues should be sent to:

JOURNAL OF GERONTOLOGY
660 South Kingshighway Blvd.
St. Louis 10, Missouri

The Ninth Annual Scientific Meeting

of the

GERONTOLOGICAL SOCIETY, Inc.

will be held at

Hotel Hamilton

Chicago, Illinois

November 8, 9, and 10, 1956

(See Program and Abstracts in this issue, pages 428-450)

AMERICAN SOCIETY FOR THE STUDY OF ARTERIOSCLEROSIS

will hold its annual meeting

November 11 and 12, 1956

at the Palmer House, Chicago, Illinois

The Program and Abstracts will be published in the October issue of *Circulation*

5485